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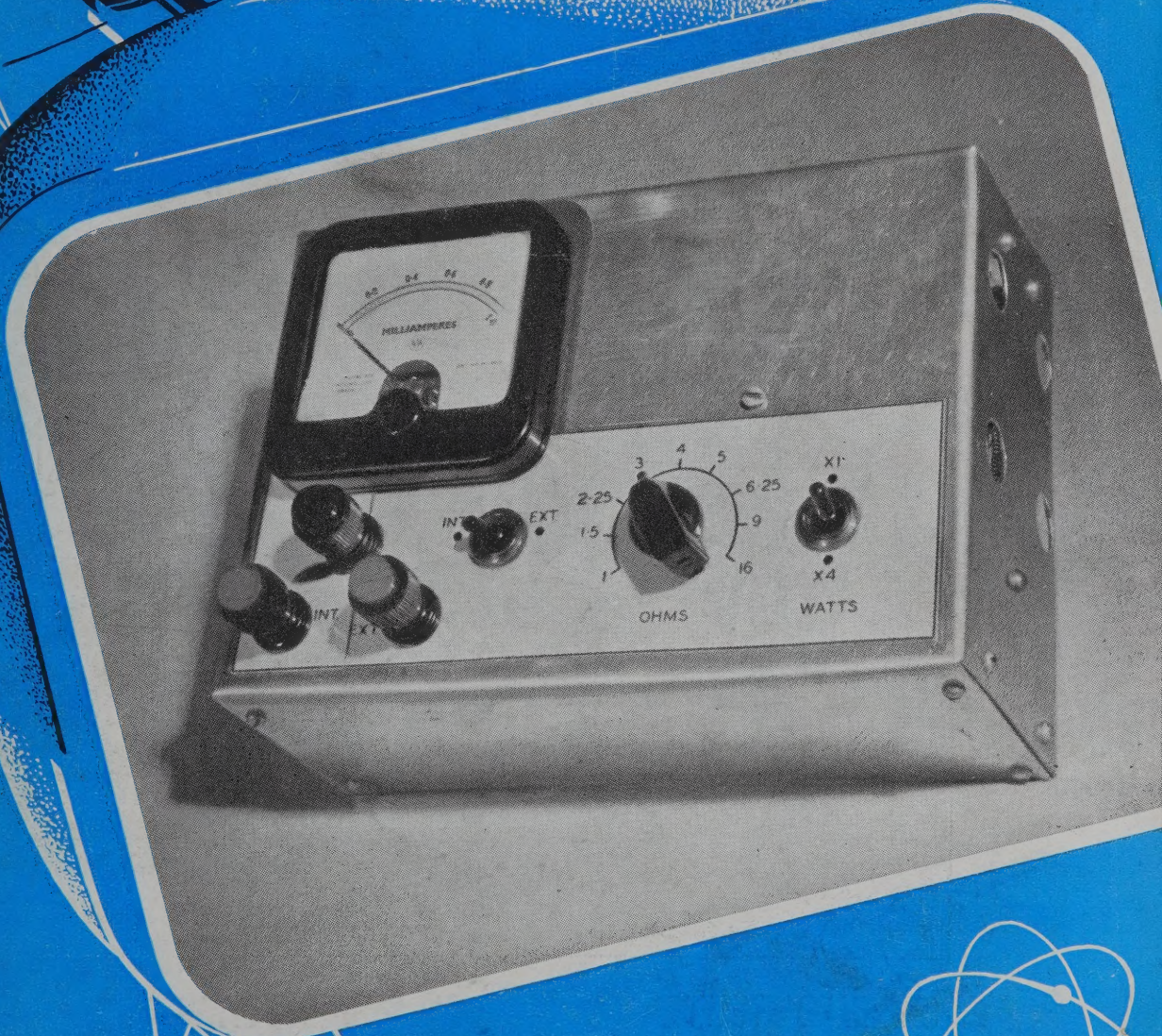

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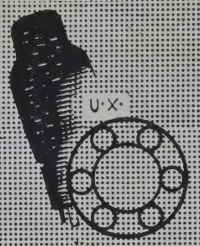

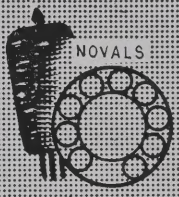

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Radio and Electrical Review

VOL. 10, No. 3 1st MAY, 1955

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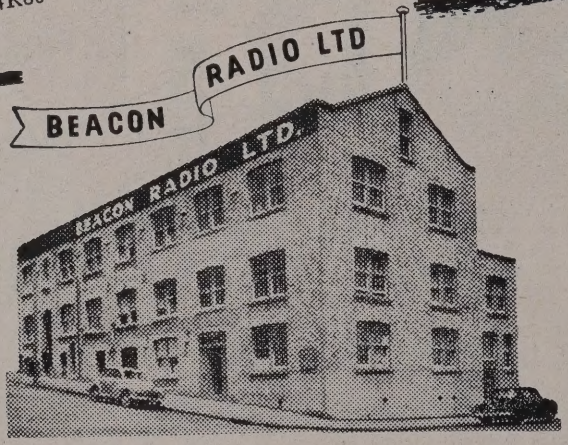

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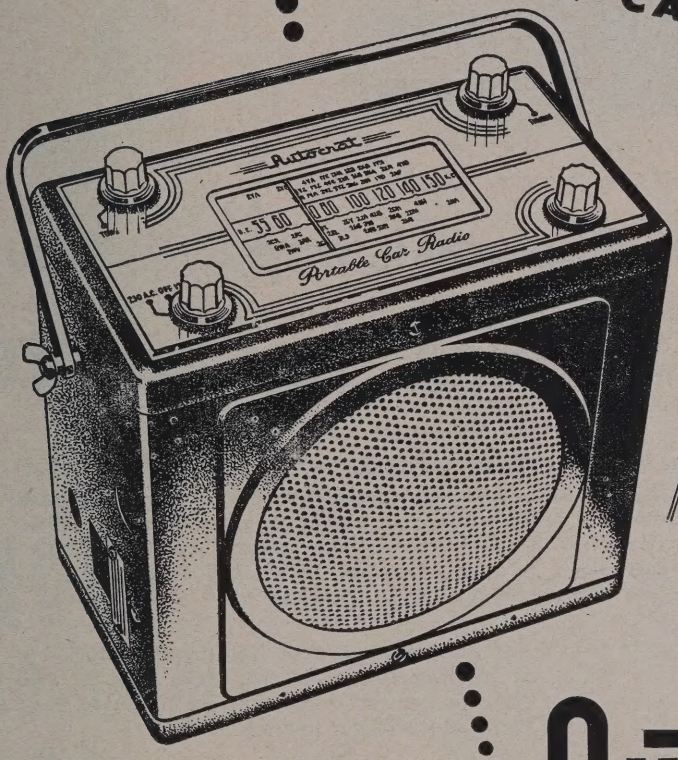

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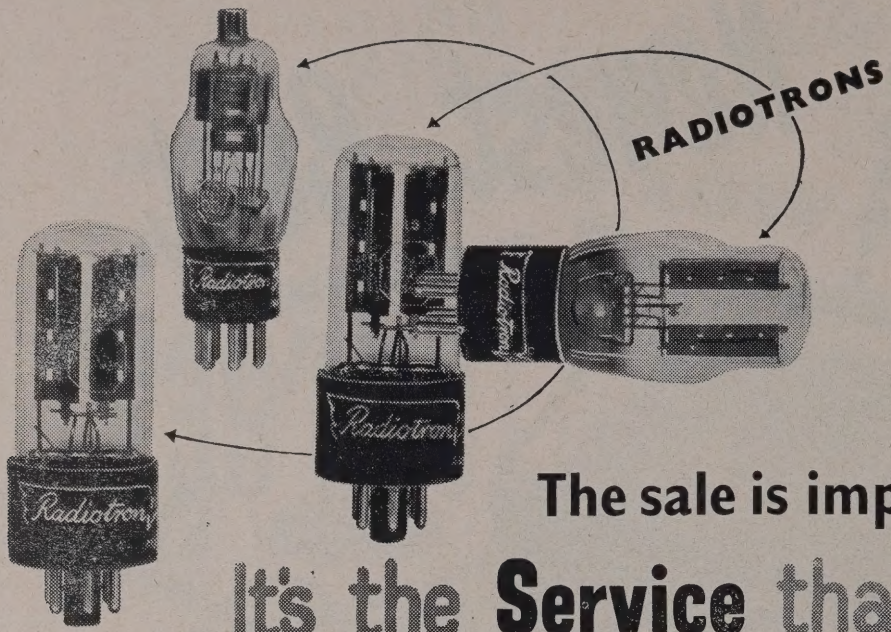

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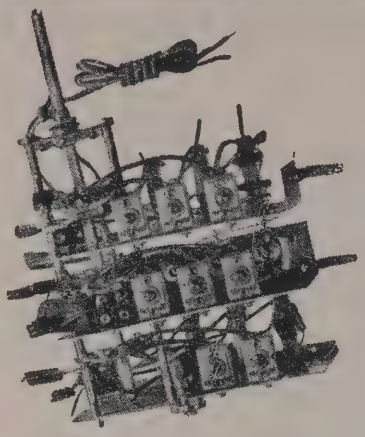

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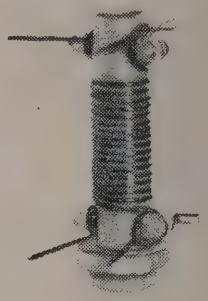

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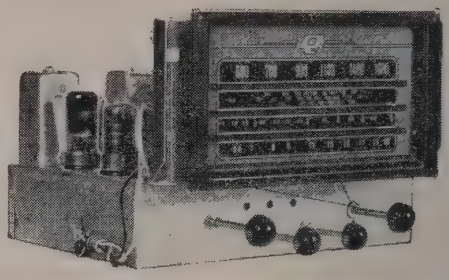

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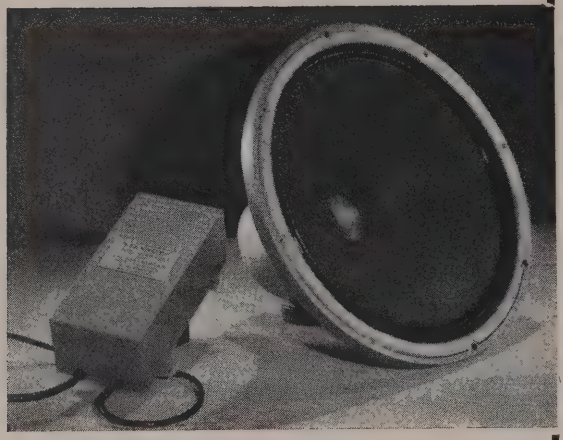

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Impedance via crossover network	18 ohms
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Flux density H.F. gap	15,000 gauss $B^2L^2 = 1.1 \times 10^{14}$
Power handling capacity	15 watts
Polar distribution for 60° inc. angle	— 3dB at 10,000 c.p.s.
Intermodulation products	less than 2%
Bass resonance	35 c.p.s.
Crossover frequency	1,700 c.p.s.
Overall diameter of frame	$12\frac{3}{8}$"
Overall depth	$7\frac{1}{2}$"
Fixing holes P.C.D.	$11\frac{3}{4}$"
Weight (crossover network in a separate unit)	10 lb. (crossover 5 lb.)
Finish	Cadmium plate & Silver hammer finish

TECHNICAL SPECIFICATION "FIFTEEN"

H.F. voice coil diameter	2"
L.F. voice coil diameter	2"
Impedance via crossover network	15 ohms
Flux density L.F. gap	12,000 gauss $B^2L^2 = 1.1 \times 10^{14}$
Flux density H.F. gap	18,000 gauss $B^2L^2 = 1.39 \times 10^{14}$
Power handling capacity	25 watts
Polar distribution for 60° inc. angle	— 4dB at 10,000 c.p.s.
Intermodulation products	less than 2%
Bass resonance	40 c.p.s.
Crossover frequency	1,000 c.p.s.
Overall diameter of frame	$15\frac{1}{4}$"
Overall depth	9"
Fixing holes P.C.D.	$14\frac{1}{2}$"
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Technical Assistance For The Serviceman

In the course of running a technical periodical such as "Radio and Electrical Review" one receives a good deal of literature from publishers, for purposes of review. Recently we have obtained an insight into servicing methods in the United States of America, by the receipt of a set of the latest works from the publishing house controlled by Mr. John F. Rider, long known throughout the world as a technical writer, more especially of books intended to ease the lot of the radio serviceman. In the days when many of the better known American sets were sold on the New Zealand market by local importers, Rider's service manuals were very well known, and greatly used here, and indeed in all countries where American radio sets were in use. As can be imagined, the advent of television has considerably widened Mr. Rider's scope, so that now, his organization is publishing a considerable volume of material, covering not only television, but such modern developments as transistors. Let us briefly describe some of these volumes.

One, entitled "Picture Book of TV Troubles," is No. 168 in what is described on the cover as the "Tell-a-Fault Series." The book is sub-titled, "Vol. 1 Horizontal A.F.C. Oscillator Circuits." As might be guessed from all this, this small book of 70 pages, is devoted almost entirely to pictures of TV receiver screens under various fault conditions, together with the sort of faulty waveform one might see on a test oscilloscope attached to the faulty circuit. In America, seemingly, four types of automatic frequency control are commonly used and these, together with their trade names (synchroguide, synchrolock, etc.) are dealt with in separate sections of the book. Copious notes are given, explaining further the visual information portrayed by the pictures, and describing faults which commonly occur with actual circuits in considerable use in many different makes of receiver.

The next book is entitled "TV Field Service Manual, with Tube Locations, Vol. 3, Emerson, Fada." This whole book is devoted to fault-finding in the television receivers turned out by only two American manufacturers during the years 1947 to 1953 inclusive. There is a diagram showing the locations of the valves in the chassis of each model dealt with, a list showing the functions of all the valves, further diagrams giving such essential data as the positions of the controls, and finally, a "trouble-shooting" page, which consists of a list of common faults, together with a number of possible causes.

A third volume entitled "TV Manufacturers' Receiver Trouble Cures" Volume 6, has a different slant, in that it has been compiled from information supplied by the manufacturers themselves, thus giving the servicing industry the benefit of the makers' own knowledge of likely trouble spots in their own receivers.

The outstanding conclusion drawn from the above is that, armed with Mr. Rider's excellent publications, one should be able to conduct a television servicing business without any prior knowledge of television or its principles! The very fact that there is presumably a large market for such literature rather indicates that in the U.S.A. this is just what many servicemen do. What such servicemen do when the particular receive., or its fault, is not to be found in any of the books they possess is difficult to imagine, unless they return the set to the manufacturer, or to one of his representatives, where someone can be found to tackle television servicing from first principles.

We do not for a moment suggest that the serviceman's job should not be made easier and quicker by providing him with ready reference daa on the sets on which he is to work. Such material is invaluable, to even the best technician, but it should *not* be used as a *substitute* for *knowledge* of one's subject. In Britain, and also here, the tendency is rather to provide too little information for him whose job it is to service radio sets and the like. While this obviously is undesirable, it cannot be said that our policy of so training a man in the fundamentals of his craft that he may find faults by the application of basic principals, is a bad one. We have heard it said often that the average radio serviceman in New Zealand is not nearly as knowledgeable as he should be, but we think it somewhat unlikely that he will need so much spoon-feeding as his American counterpart, even when he does have to cope with the complexities of television. In extenuation it may be said that television receivers in the U.S.A. are considerably more complex than, for example, British ones, but this seems to us merely to provide a more cogent argument for the view that training from first principles is absolutely essential, however much detailed assistance is available in specific cases.

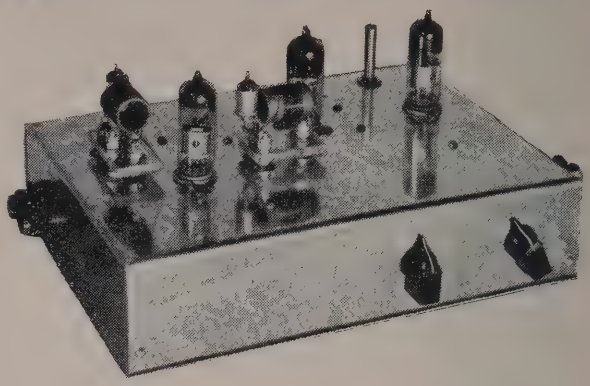
For...the...Amateur

A BROAD-BAND CONVERTER for 6 and 10 METRES

INTRODUCTION

Whenever receivers are discussed among amateur transmitters, the relative merits of different systems of reception for the higher bands are argued back and forth with much gusto. One man will swear that his commercial receiver is as good on ten metres as it is on 80, while another is equally certain that the best results are to be obtained by using a separate converter ahead of a conventional receiver. Our own opinion inclines to the latter view, for it is at about 30 mc/sec. that conventional methods of receiver construction, and ordinary receiving valves, begin to strain their resources somewhat. That being so, the separate converter comes into its own, as possessing all, or most of the advantages that would be expected from a receiver designed specially for the band concerned, while retaining the economy to be gained by using the main receiver as part of the system. The issue is not quite as clear-cut as this, however, because there are different systems that can be used, even if a converter has been decided upon. A very popular one in the United States is to give the converter a crystal-controlled oscillator, and to convert the band to be received into a new band, equally wide in terms of megacycles, but within the tuning range of the main receiver. Then, signals are tuned by tuning the receiver over this new band. This is quite a simple principle, and it has several advantages. Chief among them is that the converter contains no continuously tunable circuit, and so avoids the use of such expensive items as special low-capacity variable condensers, and a dial movement of good quality. At the same time, difficult constructional problems are avoided too. For example, there are no circuits which have to be tracked, however many R.F. stages one decides to put into the converter. Everything in it is fixed-tuned, so that alignment for peak performance is very simple and can easily be done without special instruments, such as the amateur is unlikely to possess. Also, provided that the fixed oscillator is accurately adjusted, the dial on the main receiver may be re-scaled to read frequencies in the band to be received, merely by adding a fixed number of megacycles to the calibration of the receiver. These days, many amateurs have invested in excellent commercial receivers, but it is still possible to improve on their characteristics at the ten metre band by using a converter. When it comes to bands higher than this one, very few commercial sets cover even the six-metre band, so that for this and the higher ones, additional gear of some sort is essential, and the cheapness and excellence of the converter scheme is still very attractive.

The other sort of converter is the one which has a continuously tunable front end, so that its output is a single intermediate frequency, which again can be anywhere within the range of the main receiver. This time, the dial of the main set is tuned to the chosen first I.F., and thereafter, tuning is done with the dial of the converter. The tunable converter has a number of disadvantages, which correspond almost exactly with the list of advantages of the fixed-tuned kind, only in reverse, as it were. In addition, the tunable converter requires a good deal more



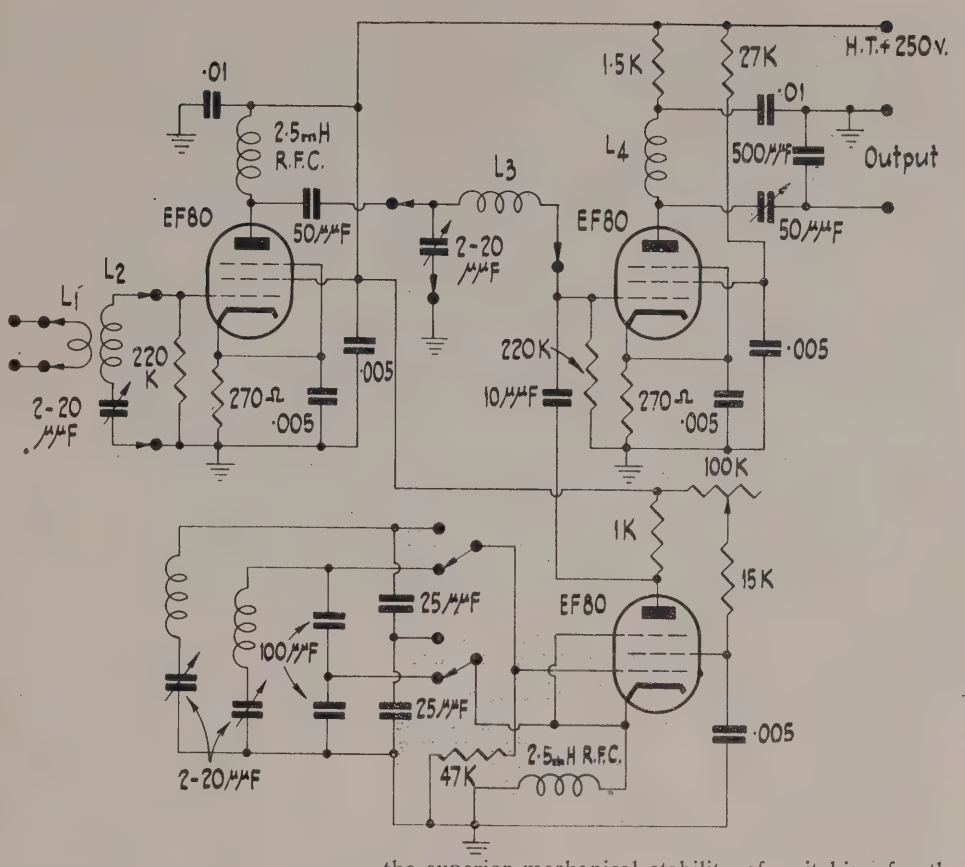
skill in building, if it is to possess any advantages over the other kind. Its one advantage, however, is that, properly built, it can have a slightly better performance than the fixed-tuned variety. The reason for this is to be found in one salient fact that has not yet been mentioned. The fixed-tuned converter must accept, preferably with equal sensitivity, all signals on the chosen band simultaneously. In other words, it must have a pass band wide enough to cover the whole band, when the circuits are peaked up on its centre frequency, This is not impossible, or even diffcult to achieve, especially at high signal frequencies, but it does mean some sacrifice in stage gain, and also in selectivity. It also means that the noise performance of the system will not be quite as good as when narrow-band signal circuits are used. Fortunately, however, the degradation of signal-to-noise ratio is not usually very great where narrow bands like the amateur bands are concerned, so that it is not difficult to pay for the very considerable advantages of the broad-band converter, as it is more often called.

THE TWO-BAND CONVERTER

One difficulty about tunable converters is that for the best results, they should be strictly single-band affairs. Many years ago, in the second issue of this journal, we described a single-band 10-metre converter which was very popular at the time, many examples of which are still in operation. At the time, we had numerous requests from readers for information on how to modify this converter to include the 6-metre band, preferably by switching, and we were constrained to advise against this course, as the design did not lend itself to modification at all.

The present converter, on the other hand has been designed specially for two-band working, so that builders will be able to make it for either band, or both, simply by leaving out the appropriate portions.

When operation on more than one band is contemplated, the inevitable question crops up, whether to have plug-in coils or to use internal band-switching. About the only argument in favour of band-switching is its convenience, and at lower frequencies, its problems have been sufficiently well overcome to



have resulted in its becoming standard. Except for the Hammarlund HRO series, with its plug-in coil units, no modern communications receiver has any other method of band changing. However, the convenience of rapid band changing on the higher bands does not mean nearly so much because, in general, different transmitters are used for these bands in any case, and a session on one of the higher bands seems more likely to be undertaken as a job for an hour or two than is the case lower down, where rapid switches from 80 to 40 or 20 metres can easily be arranged if conditions on one do not suit the operator. Thus, if the convenience of band switching is not demanded as an essential, one of the other possible schemes can be used, together with their own particular advantages, if any.

At high frequencies, plug-in coils can have much to recommend them, under certain circumstances, and the type of circuit used in this converter comes into that category. A glance at the circuit will show that the the converter consists of a tuned R.F. stage, followed by a mixer and its oscillator. The grid circuits of the R.F. and mixer stages employ what is often, but wrongly called series tuning, because the only visible tuning capacity is in series with the inductance. This type of tuned circuit lends itself particularly well to a physical lay-out which follows the run of the circuit diagram almost exactly. It enables the coils, especially in a single-band circuit, to be mounted right up to the valve sockets, with a minimum of stray inductance due to long leads. The circuit and its corresponding lay-out are very satisfactory up to frequencies as high as three or four hundred megacycles per second, provided no band changing is contemplated, but at lower frequencies, such as 50 mc/sec., it can readily be adapted, with few electrical disadvantages, for using with plug-in coils. It could even be used for switching, with rather more difficulty, but here we have settled for plug-in coils for the R.F. end of the circuit, with switching for the oscillator. This is a rather unusual course to follow, but it is one we think well worth while. In the first place, it means that only two plug-in coils per band have to be manipulated, and secondly, the superior mechanical stability of switching for the oscillator, which has to retain its frequency with considerable accuracy, on band changing, is a further advantage. When only one circuit has to be switched, it can be done quite regardless of the lay-out of the remainder of the circuit, but when two or more circuits have to be switched, and controlled from the same operating shaft, the restriction placed on the possible locations of the parts makes the devising of a suitable lay-out very difficult. Hence, the use of switching for the oscillator does not detract from the excellent lay-out that can be used in the most important R.F. section of the converter.

TUNABLE OUTPUT CIRCUIT

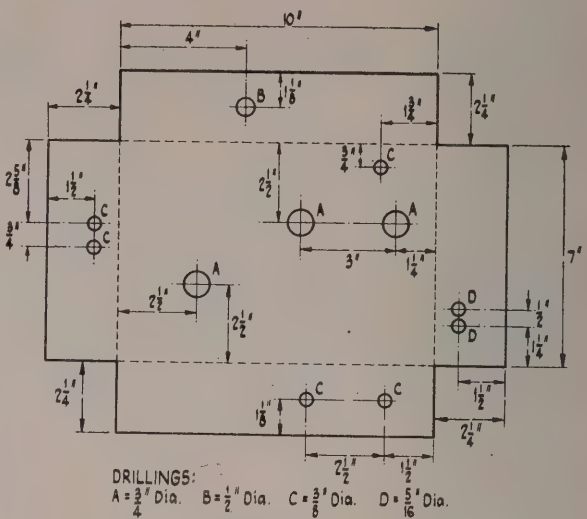
We have never believed in using conventional methods for their own sake, and an example of this is the decision to use a mixture of plug-in coils and band-switching, because by this means, the advantages of each can be obtained. Another unconventional feature of this converter is the use of a tunable output circuit, with the control brought out to the front panel. Once more, this is an attempt to have one's cake and eat it too, and in our opinion it pays dividends. There is a very good technical reason for using such an unusual arrangement. It was mentioned earlier, that the drop in performance caused by using broad-band rather than sharply tuned circuits in a converter is very slight, and this is truer, the higher the signal frequency. For example, at high frequencies, we cannot assume, just

because we know that we can make low-loss tuned circuits with Qs of round about 200 quite easily, that when the circuit is installed and working, its Q will remain at that figure. Valves, for example, have very low input impedances at high frequencies, so that hitching up the valve's grid circuit to the tuned circuit immediately causes a large loss of Q. This results in a loss of selectivity, or a gain in bandwidth, whichever way we look at it, so that if we want extreme R.F. selectivity, we find it rather difficult to come by. On the other hand, if we want to achieve great bandwidth, for the purposes of a fixed-tuned converter, we have just what we are after, often without having to take any special precautions to obtain it. Thus, wide-band techniques are really tailor-made for the V.H.F. bands, where tuned circuits are broad-band whether we like it or not. Now at the output end of a broad-band converter, conditions are very different. We are transforming the R.F. band to a much lower frequency, and this means that the required bandwidth is much harder to attain. Let us take an example. Suppose we are looking at the 6-metre amateur band, which ranges from 50 to 54 mc/sec. The average frequency is 52 mc/sec., and the bandwidth is 4 mc/sec. If a tuned circuit has a Q of 13, its response will be 3 db. down at 50 and 54 mc/sec., when the circuit is tuned to 52 mc/sec. This is quite a low Q, and it is certain that a narrow-band circuit, even with the valve connected to it, could be made to have a considerably higher Q than this. However, with a Q of 13, a useful amount of selectivity will be obtained at signal frequency, and if high-gain valves are used, there will be a useful amount of stage gain. But look at the situation in the output circuit of the converter. Suppose, for the sake of argument, that the I.F. chosen is 9½ mc/sec. This means that a fixed-tuned output circuit on the converter will have to accept signals from 7½ to 11½ mc/sec., without attenuation, when fixed-tuned to the centre-frequency of 9½ mc/sec. Here, the band is still 4 mc/sec. wide, and instead of being about 8 per cent. of the centre frequency, as it is at the signal end, it is approximately 42 per cent. of the centre intermediate frequency. This in turn means that if the output circuit is to be broad-banded, its Q cannot be greater than 2.4. With an output circuit of as low Q as this, the mixer stage's conversion gain will be very low, and performance will undoubtedly suffer.

There are two ways out of this difficulty. The usual method is to raise the intermediate frequency to the point where the bandwidth is not nearly such a large fraction of the centre frequency. This is not always desirable, because the performance of the main receiver deteriorates, the higher the input frequency, so we reach somewhat of a stalemate.

However, there is an alternative, and little used solution to the problem. It consists in making the output circuit of the converter narrow-band, so that a high Q and thus a high conversion gain can be achieved.

If this is done, the output circuit will have to be made tunable, and be given a panel control, which adds slightly to the complexity of operation. Not significantly so, however, for it is a simple matter to peak the tuning of the output circuit to the point which gives the greatest noise output, re-tuning it once or twice as the main dial is tuned over the band. The inconvenience of having to tune the output is really very slight, and is well worth putting up with in order to secure the advantages of (a) working the main receiver on a sensitive part of its range, and (b) increasing the efficiency of the converter. This is the solution chosen for the present circuit, and the I.F. has been given a centre frequency of 9.5 mc/sec. Thus, in order to tune over the 6-metre band, from 50 to 54 mc/sec., the main receiver is tuned from 7.5 to 11.5 mc/sec. The 7.5 mark on the dial can be labelled 50 mc/sec., the 8.5 mc/sec. mark, 51 mc/sec., and so on, and if the fixed oscillator of the converter has been set accurately to the correct frequency, the accuracy of indication of the signal frequency on the main dial of the receiver will be as good as its own original calibration.



Working drawing for the converter's chassis.

FEATURES OF THE CONVERTER

At this stage, after all the discussion, it might be as well to set down concisely the features that have actually been built into the converter:—

(1) Broad-band tuned-radio-frequency amplifier stage.

(2) Plug-in coils for the R.F. and mixer stages.

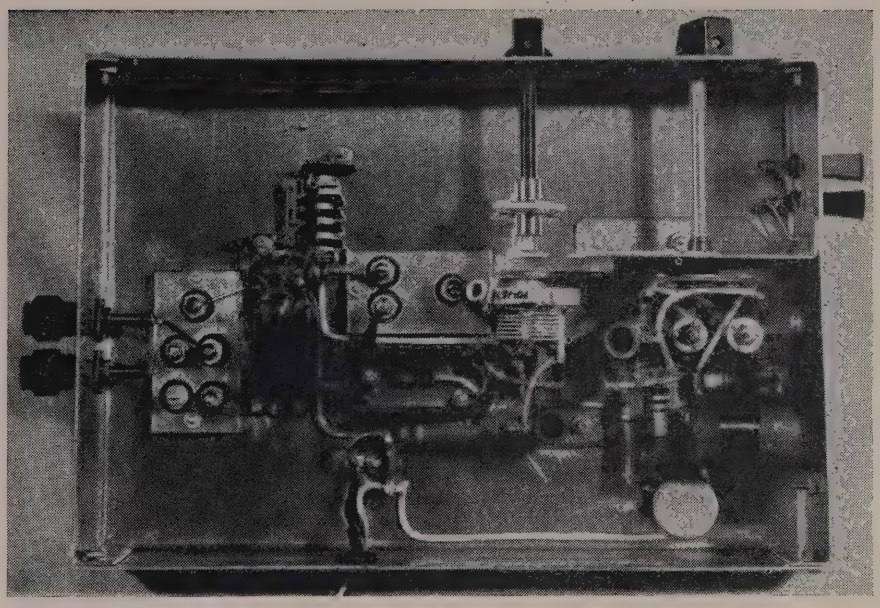
(3) Band-switching for the fixed-frequency oscillator.

(4) Centre of the I.F. band to be at 9.5 mc/sec., with the main receiver tuning from 7.5 to 11.5 mc/sec. for the 6-metre band, and from 8.5 to 10.5 mc/sec. for the 10-metre band.

(5) Output of the converter tunable from a panel control.

(6) Low-impedance output coupling from the converter to the main receiver, giving (a) good matching to almost any receiver, and (b) equalization for the natural increase in conversion gain towards the high-frequency ends of the bands, so that overall sensitivity remains sensibly constant.

(7) Modern high-Gm valves used in the converter for high gain together with low inherent noise.



Of these, the first five have already been dealt with, but the sixth is an interesting one that could do with some amplification for those who like to know just why the circuit is made up the way it is.

A glance at the circuit will show that the output from the mixer stage is obtained in the usual way by placing in the plate circuit, a circuit tuned to the output frequency. This is series fed, and the tuning is performed by two condensers in series. One of these is variable, and much smaller in value than the other. Together, they form a capacitative potential divider and impedance transformer, stepping down the very high impedance at the plate of the mixer to a low impedance which will match the aerial coil of the receiver. Since the smaller condenser is variable, for tuning purposes, the ratio of the potential divider will vary also, and it might be thought that this would cause variation of sensitivity over the band. However, over a relatively small frequency range, such as 7.5 to 11.5 mc/sec., we can regard the R.F. resistance of the tuning coil as constant. This being the case, the dynamic impedance, which determines the conversion gain, other things being equal, will increase in proportion to frequency, which means that the gain will be higher at the high-frequency end of the range. The capacitative voltage divider, on the other hand, provides a smaller fraction of the output voltage at the high-frequency end of the range than it does at the low end, and this effect is roughly inversely proportional to frequency, so that this effect compensates for the effective rise in gain at the high end of the band, the two together giving almost constant gain over the band—a highly desirable state of affairs.

VALVE TYPE USED

Readers may ask why we have chosen the EF80 for use in the converter, and whether or not they can use some other valve which they may have on hand, instead of having to buy three of a relatively new type. The EF80 is a modern high-gain pentode, specially designed for television applications. There, it is used as an R.F. amplifier, mixer and oscillator, as well as in wide-band I.F. stages and video stages. It has the Noval nine-pin base, and is not a particularly expensive type, being one of the preferred types for new equipment design. It is worth knowing that these preferred types are frequently less costly than older types which the makers are trying to work into the obsolete category so that they can cease their manufacture. For the job in hand, the EF80 is probably one of the best valves available, with its low inter-electrode capacities and very high mutual conductance of over 7 ma./volt. As a mixer, it has a conversion conductance of over 3 ma./volt, which is enormous when compared with the figure of 0.5 to 0.7 ma./volt exhibited by ordinary oscillator-mixer tubes, such as are used in broadcast and short-wave receivers. The pentode also has a very small equivalent noise resistance, both as an R.F. amplifier and as a mixer, so that the signal-to-noise ratio of the converter can be expected to be remarkably good in spite of the fact that its R.F. circuits are broad-banded. Incidentally, a further advantage of the tunable output circuit is that it materially improves the signal-to-noise ratio as well as the mixer conversion gain.

It would certainly be possible to use other tubes in the converter, since the only changes that are likely to be needed are slight ones to the tuning circuits, to take care of the different inter-electrode capacities, which would otherwise alter the tuning range slightly. Suitable types would be the 6AK5, 6AC7, EF50, or EF91, any of which should give excellent performance in this circuit. Of course, cathode and screen resistors would probably have to be changed too in order to obtain the correct D.C. operating conditions for these valves. We would like to stress the importance of the mixer stage to the performance of a converter like this one. Unfortunately, the exact operating conditions for giving the best results as a mixer are not always given in the tube books, and it is an advantage of the EF80 that this information is given very fully, on account of its use in this role in television receivers. Accordingly, we would advise builders if at all possible, to stick to the EF80 for the mixer, even if other tubes are used for the remainder. Getting the best out of a pentode mixer is a matter of fairly critical adjustment, so that if other tubes are used in the oscillator stage, for example, even this can have a marked effect on the conversion efficiency of the mixer, because the oscillator injection voltage is fairly critical. It is for this reason that a pre-set oscillator output control has been incorporated in the design. It can also be used to make the circuit suitable for use with other

valves than the ones specified, by altering the oscillator output so as to get the best results.

CONSTRUCTION

The construction of the unit is well illustrated by the photographs and chassis drawings. It is built on a chassis 10 in. x 7 in. x 2¼ in. The R.F. and mixer coils are mounted by means of plugs and sockets, which are attached to small pieces of perspex sheet. Holes are punched in the chassis to allow the sockets to come through, and the pieces of perspex with the sockets mounted on it are screwed to the chassis. The one for the R.F. coil has five sockets, one each for the two ends of the aerial winding, and three for the grid coil. One of these has been used only as a tie-point for the Philips trimmer, which is located on the plug-in coil in each case, so that no adjustments have to be made on changing coils. The job in this case could have been done with only four plugs and sockets, but the fifth makes a very firm and stable termination for the other end of the trimmer. Only three plugs and sockets are needed for the mixer grid coil. The placement of this coil is important, and a look at the photograph will show that it has been arranged so that very short leads are possible to the plate pin of the R.F. stage on the one hand and the grid pin of the mixer on the other.

The switch for the oscillator coils is to be seen mounted on a small bracket, with an extension shaft through the front of the panel. This has been done to enable very short oscillator leads to be used, for both points switched are above earth to R.F. Use has also been made of the bracket to mount a small piece of perspex on which is mounted the tuning condenser for the output circuit. This brings it close to the plate pin of the mixer, also making for short leads in this important part of the circuit. The 10-metre oscillator coil can be seen mounted on the side of the chassis, while the six-metre one is vertically on the chassis, close to the switch. The coil on the chassis, directly in front of the output tuning condenser, is the one belonging to the tuned output circuit. A lead from it can be seen going to the stator of the variable condenser. The 500 $\mu\mu$f. fixed condenser in the output circuit is connected straight from the rotor lug of the variable to the common earth point for the mixer stage. This is a solder lug clamped under the valve socket's mounting bolt, and is directly underneath the variable condenser. The 0.01 μf. plate bypass condenser is also returned to this point. The output terminal of the converter is the junction between the 50 $\mu\mu$f. variable and the 500 $\mu\mu$f. fixed condensers. As this is a point of low impedance, a fairly long lead to the actual terminal on the side of the chassis does not matter.

OSCILLATOR AND OUTPUT COILS

The winding data for these coils is as follows:—

(1) 10-Metre Oscillator Coil

13 turns of 23-gauge S.W.G. enamelled wire, double spaced on a 1 in. diameter former.

(2) 6-Metre Oscillator Coil

10 turns of 23-gauge S.W.G. enamelled wire, double spaced on a ½ in. diameter former.

(3) Output Coil

35 turns of 36-gauge S.W.G. enamelled wire, close wound on a ½ in. diameter former.

R.F. AND MIXER COILS FOR 10 METRES

(1) Aerial Coil

L_1, aerial winding, 4 turns, and

L_2, grid winding, 15 turns. Both these are of 28-gauge S.W.G. enamelled wire. The grid coil is double spaced, and the aerial winding is interwound in the middle of the grid winding. The former is ¾ in. in diameter.

(2) Mixer Grid Coil

L_3, 15 turns of 28-gauge S.W.G. enamelled wire, double spaced on a ¾ in. diameter former.

The details of the six-metre aerial and mixer coils will be given in Part 2 of this article, in which the setting-up procedure will be outlined.

(To be continued.)

OPERATION 'HAM' SAVES LIVES IN AUSTRALIA

"Operation Ham" went into action immediately normal communications broke down during the recent disastrous New South Wales floods, and amateur radio operators worked long and strenuous hours to help save lives, homes and towns in the flood.

For hundreds of square miles of flooded country they kept communications open, and in some ravaged towns they were the sole vital link with the outside world. Without them, the authorities could not otherwise have known of the desperate plight of some centres. In three instances, radio amateurs were dropped by parachute into flooded towns.

Immediately after the general "alert" had been given members of the Wireless Institute of Australia, messages began to pour through. "Hams" remained at their radios inside and outside the flood area day and night with only short breaks for food and sleep. Inside the flood areas they operated from any position possible, sometimes from Army "ducks" and other vehicles, sometimes from buildings into which the floodwaters had penetrated and sometimes even from tree-tops only feet from swirling waters.

They were the first to get word out of flood-stricken Singleton, Warren Nyngan, Gilgandra, and Narrabri. Without their help, said flood officials, many more lives and homes would have been lost. In one week amateurs relayed 5,000 messages from isolated post offices in flooded areas.

A typical example of their sterling work in the flood drama is this story of Tamworth where a "ham" sent out an Army call for relief, reading "A repeat flood is on the way. More 'ducks' required in Tamworth." Atmospheric conditions prevented the message reaching "ham" headquarters in Sydney, but the message was picked up by a Queensland operator who relayed the call which was then heard by a "ham" in a Sydney suburb. The latter passed the request on to the Wireless Institute headquarters and soon Army "ducks" were on their way to Tamworth.

To all Australian "hams" we say "Well done," and send our warmest good wishes for the success of their organization in all its undertakings.

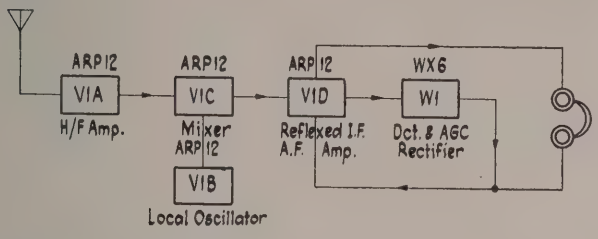
WIRELESS SET No. 38, MK1, 11, 11', 111, AND AFV

By PHILIP HOWELL

INTRODUCTION

In the past, a great deal of well-made serviceable equipment released through disposals has been dismantled for components simply because there was no technical information readily available concerning it.

Recently, a considerable number of Type 38 sets have appeared on the market, and it is the aim of this article to provide the relevant technical data, as well as simplified circuits, which should enable an apparently complicated piece of equipment to be understood.



Block diagram on "Receive."

General Description

Wireless Set No. 38 was designed as a lightweight pack set for short range R/T communication, and was issued to infantry.

The three marks are essentially similar. Mark I differs in that the batteries are in a common case with the set. Marks II, II', and III have the batteries in a separate pack. The Mark II and II' sets differ in the values of the components used in the local oscillator tracking circuit, which is switched in on receive. The Mark III is a fully tropicalized version of the Mark II', with a crystal calibrator in addition. The AFV model is an adaptation of the Mark II' for use in armoured fighting vehicles, and has a vibrator pack and facilities for use in conjunction with the well-known No. 19 set.

The set is fitted with a webbing harness and is intended to be worn over the left breast, the haversack containing the batteries being slung over the shoulder.

Weight and Dimensions	Set	Battery
Length	9 inches	6½ inches
Breadth	6½ inches	6½ inches
Depth	4 inches	3 inches
Weight	6¼ lb.	6 lb.

Range of Communication

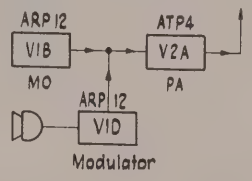
With the aerials supplied, this depends upon whether the 4 ft. or the 12 ft. rod is employed, the average figures for normal open or rolling downs type country of reasonable soil conductivity being three-quarters of a mile on the short whip and two miles on the long whip. Naturally, these ranges are conservative, and are based on the daytime groundwave propagation of signals, indicating what the set may be depended upon to do at any time. With skywaves under reasonable conditions, ranges of up to several hundreds of miles might be obtained.

It should be noted that no provision is made for either changing the tuning or the coupling of the aerial, so that some internal modification must be made before aerials having appreciably different characteristics from those of the rods supplied can be used.

The four aerial rods are carried in a webbing scabbard which is similar to that carrying the top sections of the familiar ZC1 aerial, but fitted with a carrying strap for looping over the shoulder. The rods are painted, copper-plated, light steel tubing.

Power Input and Output

The power requirements are 150 volts D.C. at 15 ma. and 3 volts D.C. at 400 ma. on transmit, reducing to 7 ma. and 200 ma. on receive. This is normally



Block diagram on "Transmit."

supplied from dry batteries. Filament dropping resistors lower the 3 volts supplied to the 2 volts required for the valve filaments.

The H-F power output is approximately 200 milliwatts. The rather low figure is a consequence in part of the use of control grid modulation and the employment of back-bias.

The power output is obtained by reading the H-F volts appearing across the resistor of the appropriate artificial aerial comprising a 13.5 PFD condenser in series with a 50-ohm non-inductive resistance of 1 per cent. tolerance connected between the small aerial socket and chassis.

Since the radiation resistance of the aerials cannot be more than a fraction of an ohm, this gives an idea of the enormous losses and the astonishingly poor efficiency of small whips operated without a proper earth connection or counterpoise. The actual power radiated with the small aerial is probably less than one milliwatt.

Frequency Range

The frequency range is 7.3 to 8.9 mc/s. for the Mark II models and 7.4 to 9.0 mc/s. for the Mark III model.

Intermediate Frequency

This is 285 kc/s.

Sensitivity and Selectivity

The sensitivity of the receiver is 35 microvolts for 5 milliwatts output.

The selectivity is 30 db. at ± 19 kc/s.

Controls

The set is built on a steel chassis which fits vertically into a steel case, with the control panel uppermost, on which are found the following controls:—

(a) The off-receive-transmit switch;

(b) The tuning dial, calibrated in megacycles, and its locking device;

(c) The test button for the aerial current test lamp.

Microphones

The No. 38 set was designed for use with low-level electromagnetic throat type microphones, either Types 1 or 2 being permissible. The total D.C. resistance quoted is 15 ohms. By this token, any low-impedance electromagnetic or dynamic unit should be suitable, such as hand microphone No. 7, better known as the ZC1 dynamic.

Headsets

The specified headsets are DLR double Nos. 1, 2, or 5, and the resistance given is 150 ohms total. Again any low-impedance headset, either electromagnetic or dynamic, should be suitable.

Valve Types

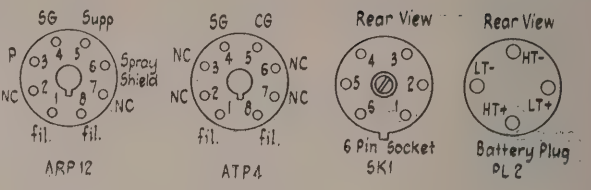
Valve types employed are the British Army versions of the Mazda VP 23 vari-mu H-F pentode and the Mazda V 248A transmitting pentode. The former has the army number ARP12 and the combined services number CV1331, and the latter is known as the ATP4 or CV1336.

The table below gives a summary of the more important characteristics.

Pin Numbering

Reading counter-clockwise from the key in the usual fashion:

ARP12: P1, filament; P2, no connection; P3, plate; P4, screen grid; P5, suppressor grid; P6, spray shield; P7, no connection; P8, filament. The control grid is brought out via the top cap.



P2, HT ; P3,-J2 (telephone); P4-J1 (microphone); P5, HT+; P6, LT+.

CIRCUITS

The Receiver

The No. 38 set is a true transceiver in the accepted sense of that term inasmuch as the bulk of the componentry, including the tuned circuits, is common to both the transmitter portion and the receiver, and, considering that the set comprises a four-valve superhet. with tuned H-F stage, separate mixer, and local oscillator, on receive, and a two-stage M.O.P.A. on transmit, this has been achieved with a truly remarkable ingenuity, as a study of the accompanying blocks and simplified circuit diagrams reveals.

In the receive position, the ARP12 valve whose grid and cathode are connected across the bulk of the aerial coil, functions as a tuned H-F amplifier, while the ATP4 output valve, whose anode and cathode are tapped across a portion of the same coil, is left with the filament unlit, so constituting

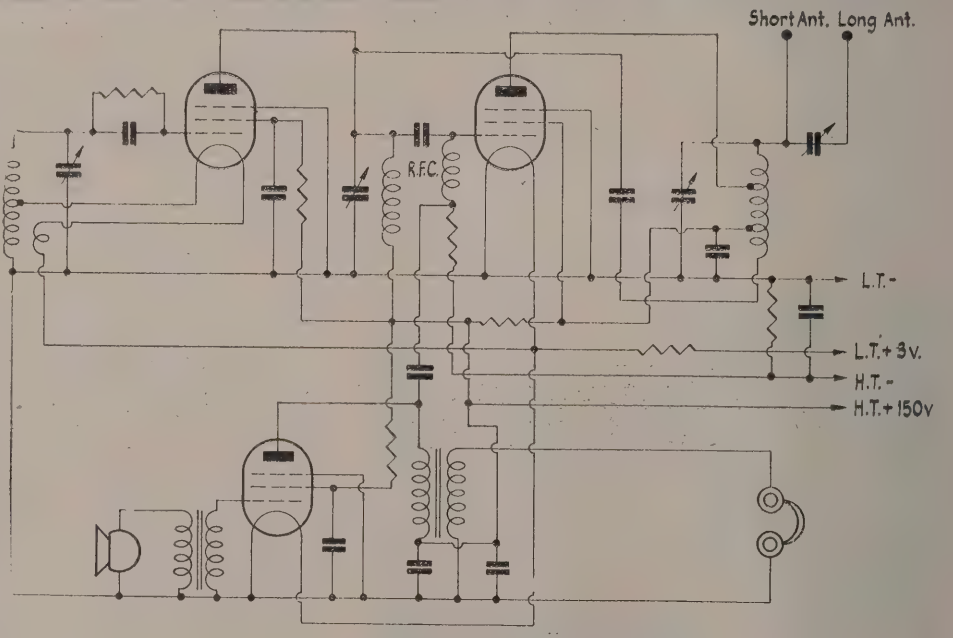
Type	Base		Rating							Characteristics Measured at			
			Fv	Fi	Pv	Sv	Pw	GM	RA	Pv	Sv	Cv	Pi
ARP12	Mazda Octal	.....	2.0	0.05	150	150	—	1.1	1.5	120	60	0.0	3.15
ATP4	Mazda Octal	.....	2.0	0.3	150	150	5	3.6	—	150	150	—8	38

ATP4: P1, filament; P2, and P3, no connection; P4, screen grid; P5, control grid; P6 and P7, no connection; P8, filament. The anode is brought out via the top cap.

Plugs and Sockets

The battery plug is a standard European four-pin type, all pins being used. Taking a rear view, the isolated pin is HT+, the pin opposite is HT—, the other two being the earth and filament positive pins respectively.

The six-pin socket which is plugged into the junction box, taking a rear view, is numbered as follows, counting clockwise: P1, LT— and earth;

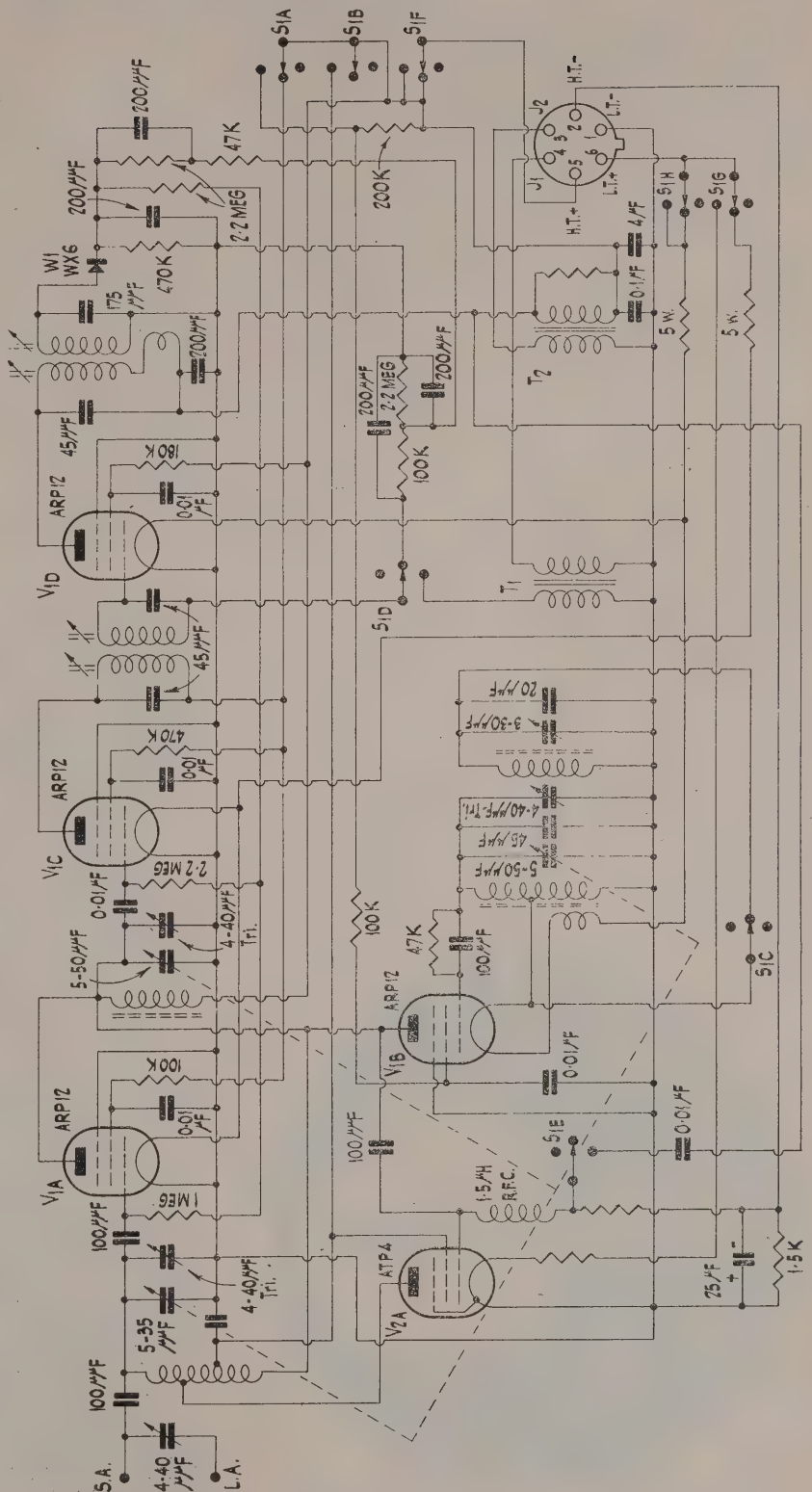


Circuit on "Transmit."

nothing more than a little shunt capacity. The signal is passed along via the tuned coupling to the grid of the second ARP12, which functions as a two-pole mixer, the local oscillator voltage being developed across the common coupling. The local oscillator runs as an electron-coupled inverted Hartley at half the signal frequency plus half the intermediate frequency (124.5 kc/s.), the intermediate frequency (185 kc/s.) to which the anode of the mixer valve is tuned being the difference between the incoming signal frequency and the second harmonic of the local oscillator. This same local oscillator serves as the master oscillator on transmit, one of the function of the off-receiver-transmit switch being to remove a shunting inductance from the oscillator's grid coil in order to lower the frequency by 142.5 kc/s, when transmitting. It also shorts one of the series screen dropping resistors, whose purpose is to reduce output of the oscillator on receive to a velue considered optimal for the mixing process.

The anode of the mixer is fed through the primary of the first I-F transformer which is conventional except for the fact that it is unshielded. The two coils are visible side by side under the chassis, a thin partition separating them from the oscillator and H-F coils. The secondary winding is connected in series with a resistance capacity network bypassing the H-F which serves as an L-F grid impedance across which the audio voltage is developed for the next ARP12, which is reflexed serving as both intermediate frequency and audio frequency amplifier. Similarly, the primary of the second I-F transformer, which is enclosed in normal shielding can, is connected in series with the primary of the output transformer, for no output stage is used, although, if it were desired, there is plenty of room for the inclusion of a miniature valve like the 3V4.

The second detector—A.G.C. restifier is an H-F copper-oxide type Westinghouse WX6, and it is housed along with the decoupling and filtering ar-



Full circuit diagram.

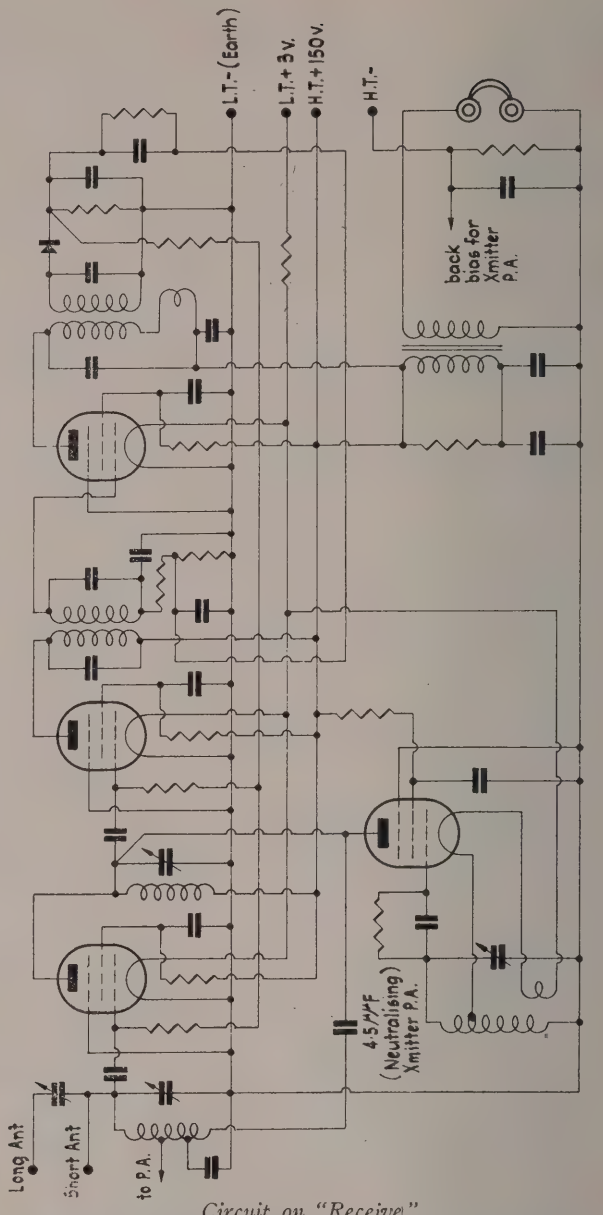
rangements inside the shield can of the second I-F transformer. It is connected across the secondary in a manner strikingly reminiscent of the old crystal set of bygone days. The audio output is fed back through a tone-compensating network to the grid net of the I-F/A-F amplifier previously mentioned, and another lead is taken away to supply the A.G.C. voltage for the H-F and mixer valves.

The Transmitter

In the transmit position, the ATP4 valve whose anode and cathode are connected across taps on the aerial coil, functions as the H-F power output valve feeding the aerial. This time the filament of the ARP12, also shunted across the tuned circuit, is left unlit, the filament circuit of the unwanted mixer valve being switched out at the same time.

The E-C-O Hartley has as its anode circuit the tuned coupling common to the H-F amplifier, which is resonant at the signal frequency. As a consequence, doubling now takes place in it. The output is capacity coupled to the grid of the ATP4 valve, which consists of a pair of pentodes in one envelope with the elements internally strapped in parallel. The grid return of the power amplifier goes via an H-F choke and a 100k. resistor in series to the fixed bias source which is the H.T. negative lead, which is negative with respect to ground by the voltage drop across the 1500-ohm back bias resistance. The 100k. resistor, as well as supplying some additional gridleak bias, serves as an impedance across which the audio modulating voltage is developed.

The A-F/I-F amplifier now serves to amplify the output from the microphone. The primary of T2 serves as an anode choke, the speech frequencies being coupled over via condenser to the junction of the H-F choke and the 100k. resistor in the final grid circuit. The secondary of T2 serves to supply the side tone so dearly loved by military operators, and without which they doubt that they are on the air!

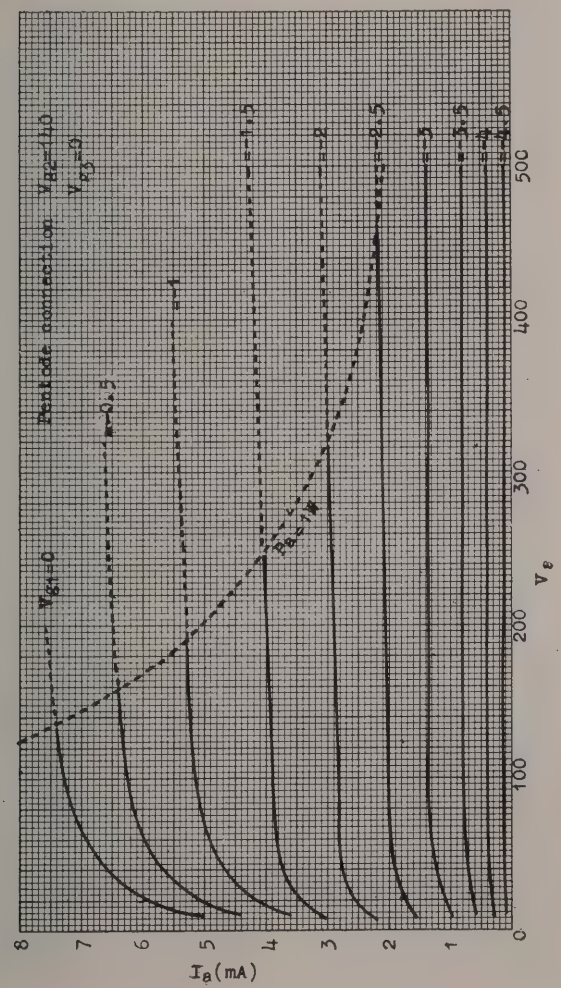


Circuit on "Receive."

TUBE DATA: THE Z729 LOW-NOISE PRE-AMPLIFIER PENTODE

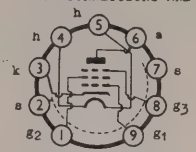
(Information by courtesy of British General Electric Co. Ltd.)

This valve has been specially designed as a low-noise, low-microphony pentode, and is especially suitable for low-level pre-amplification in audio amplifiers. It can give an amplification of up to 200 times, with a plate load resistor of 220k. ohms, or 110 times with a load resistor of 100k. ohms. Under these conditions, the hum level referred to the control grid, when A.C. is used on the heater, is not greater than 1.5 microvolts. This is a very low figure, but it should be remembered that the amount of hum appearing at the output terminal will be this figure, multiplied by the stage gain. For instances, when used with a 100k. load, and a gain of 110 times, the hum output will be approximately 150 microvolts, or 0.15 millivolts. If a signal-to-hum ratio of better than 60db. is required, this means that an input signal of at least 1.5 millivolts, or an output of 150 mv. will be required. Since even the most insensitive gramophone pick-ups give an output of some 6 mv. or more, it can be seen that completely hum-free operation should be obtainable from these. It will still be necessary, however, to take care when the tube is to be excited by a low-level microphone. If the microphone output itself is too small, it may be stepped up by the use of an input transformer.



A low noise pentode for use in the early stages of high gain audio amplifiers.

BASE CONNECTIONS AND VALVE DIMENSIONS



View from underside of base.

Base: B9A
Bulb: Tubular

Overall length: 49-55.5 mm
Seated length: 43-49 mm
Max. diameter 22 mm

RATING

V_h	6.3		V
I_h	0.2		A
V_{h-k}	150	max.	V
V_a	300	max.	V
V_{g2}	200	max.	V
I_k	6	max.	mA
r_a at V_a=250, V_{g2}=140, I_a=3mA	2		MΩ
g_m at V_a=250, V_{g2}=140, I_a=3mA	1.85		mA/V

CAPACITANCES (of cold externally unscreened valve).

c_{g1-a}	0.025 pF	c_{in}	4.0	pF
c_{g1-h}	0.0025 pF	c_{out}	5.5	pF

TYPICAL OPERATION

V_a(b)	175	175	V
V_{gain}	180	110	
I_k approx.	0.6	1.2	mA
R_k	2.2	1	kΩ
R_{g2}	1	0.47	MΩ
R_a	220	100	kΩ

HUM When used under the above conditions with the control grid returned to earth via a 470kΩ resistor, the total hum voltage referred to the grid will not exceed 1·5μV. If A.C. heating is used the heater winding should be provided with a centre-tap. A variable hum balancing resistor is not required.

MOUNTING Any position.

RETAINING The use of a retaining device is recommended.

SCREENING The valve is internally screened. A separate screening canister may be used when the application demands.

MICROPHONY The standard of microphony permits the use of the valve in the first stage of a high gain amplifier following a low level microphone or tape reproducer.

The PHILIPS Experimenter

No. 91: Philips Transistors (Part 6)

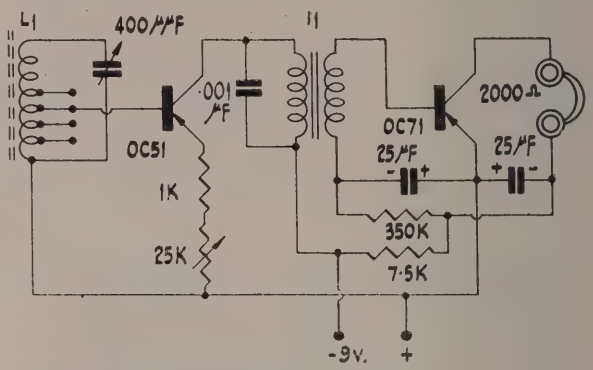
Reprints of these EXPERIMENTER articles, complete with illustrations, will be mailed to any address for one year for a subscription of 5s. Application should be made to Technical Publications Department, Philips Electrical Industries of New Zealand Ltd., P.O. Box 2097, Wellington.

A TRANSISTOR PORTABLE RECEIVER

One of the most interesting and instructive projects for the experimenter with transistors is a transistorized portable broadcast receiver. In some respects, such a set is rather spectacular. In areas of good signal strength, it will give excellent performance with a Ferroxcube rod aerial, and its supply requirements are ridiculously small. The prototype set used a 9-volt battery and had a consumption of 1 ma. Needless to say, it did not operate a loudspeaker, but was arranged for headphones, in which it was able to make an uncomfortably loud noise. Indeed, it reminded us of the old days when signal strength was measured in such units as "phones on the table, loud and clear." This set has literally been kept going for weeks at a time without turning it off, and it is going as we write, giving us the latest on the first cricket test with the phones hanging round the neck! In case anyone might ask why we did not design it for loudspeaker operation, we might mention that this was purely out of regard for constructors' pockets, transistors not yet being able to compete on equal terms with valves—at least for home-constructors' purposes.

The receiver is a simple regenerative detector, followed by one stage of audio amplification. From what we have already said, readers will not be surprised to find that the detector employs a Philips OC51 point contact transistor, while the audio stage uses one of the Philips OC71s, which were specially designed for hearing-aid output stages. The detector circuit is a variation of the base negative-resistance oscillator, which we described in the last instalment. In this case, the main modification is the provision of means whereby the degree of regeneration can be controlled, as in an ordinary valve regenerative circuit. The method used is to insert a variable resistance in the emitter lead, a very simple arrangement that gives very smooth control over the regeneration, and which will be found considerably more stable in operation than the methods used with valve regenerative detectors. Earlier in this series we mentioned that, owing to the current amplification between emitter and collector in a point transistor, and owing also to the base resistance, this type of transistor exhibits negative resistance, or instability, if either the collector or emitter circuits are short-circuited, and there is less than a certain amount of resistance in the other electrode's circuit. The situation is actually quite complicated in practice, because we have three things that can be varied: (1) the impedance between base and earth, (2) the resistance in the emitter circuit, and (3) the resistance in the collector circuit.

In the circuit given here, we have a 0.001 μfd. condenser shunted across the audio transformer primary,



and this condenser forms a short-circuit at radio frequencies. We thus have the situation that there will at all times be regeneration, and this will be greater the smaller the amount of resistance in the emitter circuit, and the greater the impedance in the base circuit. With a given coil and tapping point, and a given tuned frequency, then the question of whether or not the regeneration is great enough to cause oscillation will depend on the resistance in the emitter circuit. By making the latter quantity variable, we obtain smooth control, and can bring the circuit as close as we please to the point of oscillation. This is just what is required for a regeneration control in a receiver. In practice, the winding on the rod aerial is tapped at several points, in order to take care of point transistors with different characteristics, as there are inevitably fairly wide differences between individual samples. The tapping points also come in handy when it is desired to use an external aerial, this being attached to the best tap, as found by trial.

Output from the detector is through a step-down transformer, in order to effect an impedance match between the detector and amplifier. The input impedance of the audio stage is of the order of several hundreds of ohms, while the output impedance of the detector is in the region of tens of thousands of ohms. In the prototype, a five-to-one step-down ratio was used, giving an impedance ratio of 25 to 1. The transformer used was a war-surplus one, taken from an ARC5 receiver. It is the output transformer, designed to match a pair of low-impedance headphones, and so is very suitable for the present purpose.

Point transistors are, relatively speaking high-voltage devices, since they require much higher voltages for their satisfactory operation than do the junction types. However, it was found that the detector circuit functioned quite well from a supply of 9 volts. At lower voltages, some specimens did not work very

well, so that this determined the voltage used. The positive terminal of the battery is earthed, and the collector of the detector is fed straight from the —9v. terminal of the battery.

The audio stage also uses a grounded emitter circuit, but this time there is no possibility of instability. The OC71 must act as a Class A amplifier, and so its circuit must be arranged so that there is a steady bias current in the emitter circuit, which in turn gives a suitable standing collector current. This biasing is done by taking a resistor of the appropriate value and connecting it to the negative side of the battery. Since the resistor is very high in value, it acts, in conjunction with the battery, as a constant current source. In other words, the resistance of the base-emitter circuit is only a few hundred ohms higher than the 350k. resistor, so that the emitter current is fixed at a value which makes the current in the base circuit equal to about 0.025 ma. The resulting emitter and collector currents are then of the order of 1 ma. This shows that the circuit has a current gain of approximately 40 times. The output impedance of a junction transistor is very high—several hundred thousands of ohms—so that it is quite satisfactory to use a load impedance of several thousands of ohms, as is represented by a pair of high-impedance headphones. The situation in the output circuit is thus very similar to that in an output pentode, which also has a very high output impedance, and normally works with a load impedance that is several times less than the plate impedance of the tube. There is thus no need for a matching transformer in the collector circuit of the output stage when high-impedance phones are employed.

There is a 7.5k. resistor in series with the supply and the output transistor. This is bypassed with a 25 μfd. electrolytic condenser, and its only purpose is to drop the voltage applied to the transistor. The maximum allowable D.C. supply voltage for the OC71 is 6 volts, so that the dropping resistor is essential. The "cold" end of the inter-stage transformer is also bypassed in order to decouple the input circuit from the supply and ensure that the 350k. resistor does not appear in the signal circuit, being concerned solely with setting the D.C. conditions of the transistor.

BUILDING THE RECEIVER

Readers will realize that this is purely an experimental circuit, and that we are not recommending any particular lay-out for building it. It would be possible, of course, to build the circuit as an extremely compact personal portable receiver were component parts available that are of a size commensurate with that of the transistors themselves. Special components for transistor circuits have been developed in the Philips laboratories, but so far only a few samples of these have arrived in this country. Sub-miniature transformers could certainly be made here, but suitably minute batteries would be hard to come by, except by disembowelling small B batteries—not a very satisfactory process. However, the main interest in the circuit, it was felt, would be that it will enable anyone who is keen on operating transistors to build a transistor receiver, even if it may not be possible to realize the ultimate in miniaturization. In any event, the pick-up from a rod aerial is a function of the length of the rod, and experience with the prototype has shown that anything much smaller than the standard aerial rod would hardly have sufficient pick-up for most purposes. However, it would be possible to build the set into a quite small box, with the aerial rod projecting from it, giving a pretty compact arrangement, especially if one headphone were built into one side of the box. Of course, the rod would have to be protected by enclosing it in a tube of insulating material, because Ferroxcube is brittle.

If any attempt at miniaturization is to be made, it would help to make the set a single-station affair only, with pre-set tuning by means of a screwdriver. This would enable a 400 μμfd. compression-type padding condenser to be used for tuning, and it would take up very little space. However, if continuous tuning over the entire broadcast band is required, this could be replaced by one of the quite small single metal-framed variables that are readily available.

The winding L_1, on the Ferroxcube rod, is made on $\frac{1}{2}$ in. diameter former, and consists of 40 turns of 34-gauge enamelled wire, close-wound. Tappings are made at 7, 10, 13, and 18 turns from the earth end. These taps are present for two purposes. First, different transistors will give the best results with different tapping points, and these allow the best operating conditions to be found for the particular transistor used. Secondly, when an additional aerial is used, as it well may be when the set is in a fixed location, the best tapping point for this can be found, regardless of which one is used for the connection to the base of the transistor.

When the wiring is completed, and the transistors are plugged into their sockets, the base lead of the OC51 is connected to the highest tap, and the set is switched on. The regeneration control is advanced until the set goes into oscillation, either with a plop or with a gentle increase in the noise level. The first thing that will be noticed about the set is the steady background hiss that is present at all times, and whose loudness does not change with the setting of the regeneration control. This is the inherent noise of the point-contact transistor, as can be proved by unplugging the OC51, and finding that the noise disappears. Unfortunately, the noise is quite loud, indicating the high inherent noise of point-contact transistors, and it can only be rendered inconspicuous by superimposing a fairly strong signal upon it. This means that signals that are not strong enough to do this will always be covered by this hiss, although it will not render even a weak signal unreadable.

Having set the circuit oscillating, the next step is to search for a signal with the tuning control. When this is heard, the regeneration is backed off, and the signal re-tuned. The regeneration can then be advanced again until the required loudness is obtained. Indeed, operating the set is in every way comparable to working a regenerative receiver which has valves rather than transistors.

It may be found that with the tapping point chosen it is impossible to prevent the circuit from going into oscillation with a plop. If this is found, the next lower tap should be tried, and it may be found that oscillation is then approached more smoothly. Some transistors seem to be subject to this ploppiness, while others will go into oscillation very smoothly. It will probably be found, also, that there is a certain amount of backlash on the regeneration control. That is to say, after the detector has gone into oscillation, the control has to be backed off well past the point where oscillation started, before it will stop again. When a regenerative set is dealing with very weak signals, this sort of behaviour can altogether prevent the signal from being received, even though quite a

loud heterodyne squeal can be heard when the detector is oscillating. Fortunately, however, local station signals are quite strong and, under these conditions, the circuit is stable enough for the regeneration control to be set very close to the oscillation point, giving a very loud signal indeed, in spite of the backlash effect. We have not been able to find the cause of this effect as yet, but it does seem to be characteristic of some transistors and absent with others.

The best setting of the base tapping point is clearly the one which gives the smoothest operation, while being as far up the coil as possible, so that the largest possible signal is presented to the input of the detector. The transistor we have had in use in the prototype is one which does exhibit the "plop" effect quite strongly, but it has turned out to be perfectly satisfactory in use. The receiver was certainly not built for it, but it has given excellent service over the holiday period when it has been taken to picnics for listening to sports commentaries, giving plenty of volume for two people to have one headphone each. There is no doubt that it would supply several sets of phones at strong listening volume, and as a purely experimental hook-up it has performed very well indeed. After some months of use, it is still operating well, with the batteries run down to 6 volts from their original nine.

The next instalment of this series will describe some typical audio amplifier circuits employing Philips junction transistors.

N.Z.A.R.T. NOTES

Demonstrations by the Franklin, Pahiatua, Nelson and Christchurch Branches at A. & P. Shows and Industrial Exhibitions during recent months have placed the Association and its activities before the public. Of necessity, demonstrations at A. & P. Shows were somewhat limited, but the message handling scheme undertaken by the Nelson Branch, was most successful. Unfortunately, the approaching Conference made it impossible for the Christchurch Branch to give a similar demonstration.

Conference arrangements are now well in hand and a good time is promised to both the "Ham and his wife!

The Association takes this opportunity to thank all amateurs for their co-operation in keeping the Australian Emergency channels clear during the recent East Coast floods. This was of great importance to the efficient working of the nets, for it is not hard for a ZL signal to cross the Tasman, and, with climatic conditions as they are over there, a close watch must be maintained on the 80 metre band for a repetition of recent operations. We also pay tribute to the Australian amateurs who gave such yoeman service. The success of their efforts has proved again that the amateur has more uses than that of merely "nattering" on the air.

Though many families boast two amateur members, the Perkins family has three in father, son, and son-in-law, ZL3KC, ZL3TD, and ZL2ASO, thus producing a family net which flourishes on frequent occasions. Incidentally, Tom, ZL3KC, is another member of the "White Stick Brigade."

Results of the Annual Field Day Contest have not yet been announced, but it seems that the final will be fought out between those old rivals, Manawatu and Franklin. Unfortunately, as usual, activity in the South Island was low.

Results of the Council Elections are as follows:—
President: ZL3HA. Vice Presidents: ZL1CH, ZL2AFB, ZL3AF. Councillors: ZL1BC, ZL1MQ, ZL1FS, ZL2ACV, ZL2ACB, ZL2AI, ZL2IJ, ZL3BG, ZL4AL, ZL4DU,

No Vice President was elected for the fourth district, but this will be done at Conference, Both ZL4DU and ZL4AL being eligible for election.

VHF activity seems to be on the wane, but it is hoped that interest will increase as the days shorten. Interest still holds on the 420 mc. band and there is news that ZL3KS has worked ZL3AQ.

Keen experimenters, ZL2AKP and ZL2GQ have been working on the 3 mc. band and though no world records have been broken, they have shown that the band can still be used, thus forging another forward step in the V.H.F. working in New Zealand.

The Christchurch Branch class for Hams has proved most popular, being packed to capacity. The success of ZL3RZ's teaching is demonstrated by eleven passes from the last twelve examination candidates, and we hope the balance of the present class will be ready to repeat this splendid performance in the September examination.

NEWS FROM GOVERNMENT DEPARTMENTS

N.Z. POST OFFICE

The first 6½ miles of the Post Office's new Auckland-Hamilton coaxial cable has arrived at Auckland in 23 drums each weighing 3¾ tons. The order is for 82½ miles. Foundations for the small repeater stations needed have been completed. There will be 14 of these and eight of the small ones have been completed. These are at Ramarama, Brewster's Road, Mercer, Hampton Downs, Te Kauwhata, Ohinewai, Papakura, and Manurewa.

Laying of the cable has commenced. When the project is completed, the cable will be able to carry up to 960 simultaneous telephone conversations.

* * * *

Toll traffic continues to increase. Between April and September last year, the volume of traffic rose by just on 10 per cent.

* * * *

One hundred miles of cable transmission tape—as well as a great deal of valuable time—will be saved each year throughout the Commonwealth following the adoption of a suggestion by a member of the Post Office cable staff. The suggestion, which relates to transmission procedure, has just been adopted by the Commonwealth Telecommunications Board in London and will become uniform practice throughout the Commonwealth.

* * * *

For the M.C.C. games in New Zealand the Post Office provided special teleprinter circuits from the grounds for press traffic. From the first test in Dunedin 45,106 words were transmitted from Carisbrook, of which 39,273 words went overseas.

At Auckland, the total was 39,715 of which 30,085 went overseas, Among other things affected by New Zealand's final innings was the telegraph traffic.

* * * *

Telephone conversations between Australia and New Zealand are now fairly commonplace, the average weekly number of calls being about 400. On the whole, there are slightly more calls from New Zealanders than inward ones from Australia.

* * * *

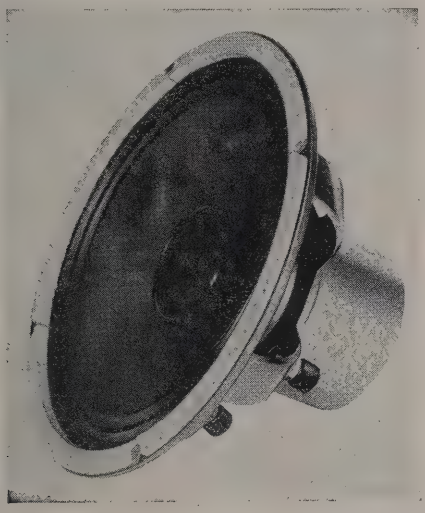
Because of the adoption by the International Telecommunication Union of a new Convention, certain radio-operating certificates will have to be revalidated. These are: General Radio-telephone, Operator's Certificate, and Restricted Radio-telephone Operator's Certificate (for marine and aeronautical work only), and the Radio-telegraph Operator's Special Certificate. Holders of these certificates should send them to their nearest Radio Inspector for endorsement.

* * * *

Office-to-office direct telegraph page-printer systems are becoming increasingly used by New Zealand's larger firms. Head Offices of larger firms are using the system to link up their branches with these private telegraph networks.

THE G.E.C. METAL CONE LOUDSPEAKER

The metal cone loudspeaker, designed and developed by the General Electric Co. Ltd. of England, will be marketed in this country in May and details are now available for constructors who wish to start work on the associated equipment. An easy-to-follow booklet describing a single amplifier designed by F. H. Britain of the G.E.C. Research Laboratories Acoustics section, who was also the designer of the speaker, is now available and in addition to stage by stage wiring instructions, the booklet gives full constructional details of the special octagonal cabinet which is stated to be necessary for the full realization of the speaker's capabilities. The loudspeaker and cabinet combined give a startingly clear and realistic reproduction of both speech and music.

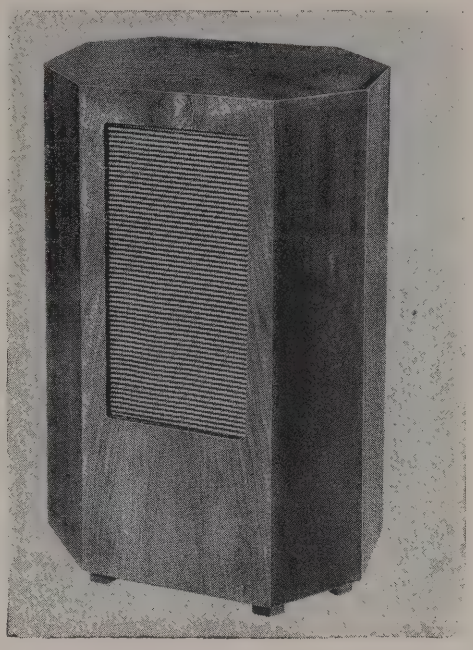


The characteristics of the metal cone loudspeaker are: an unusually wide and smooth frequency response, very low cross-modulation, a good transient response, and an exceptional performance at the bass frequencies. The cabinet incorporates new design features which take a full advantage of these characteristics, and the bass performance in particular is unrivalled for a cabinet of this size. The colouration normally produced by major resonances occurring in the audio frequency range is entirely absent, so that there is no "boominess" in speech, no muddling of orchestral passages, and no over-accentuation of the higher frequencies—all features which normally tend to spoil the illusion of realism.

The equipment will appeal especially to music connoisseurs. It is suitable for high quality reproduction in a small hall, a lecture room or the home, and its relatively low price brings really faithful sound reproduction within the reach of more people than ever before.

THE METAL CONE LOUDSPEAKER

The loudspeaker is built round a light but rigid duralumin cone with shaped deformations which contribute to a smooth frequency response. Further smoothing is provided by a central "bung" which eliminirregularities in the middle frequency response. The plastic material used for the flexible surround has



been specially formulated to provide the correct mechanical impedance termination for the cone. The magnetic system incorporates a highly efficient Alcomax III ring magnet, which provides a flux density of 13,500 gauss, and the magnetic gap and speech coil have been carefully designed so that a constant driving force is obtained up to the largest cone displacements, thus eliminating driving force distortion. The speech coil is wound on a metal former so as to obtain extreme rigidity and reliability, and an improved transient and high frequency response.

The working parameters are as follows:—

Maximum instantaneous power rating: 12 watts.

Continuous power rating: 6 watts.

Fundamental resonance: less than 2 db at 45–50 c/s.

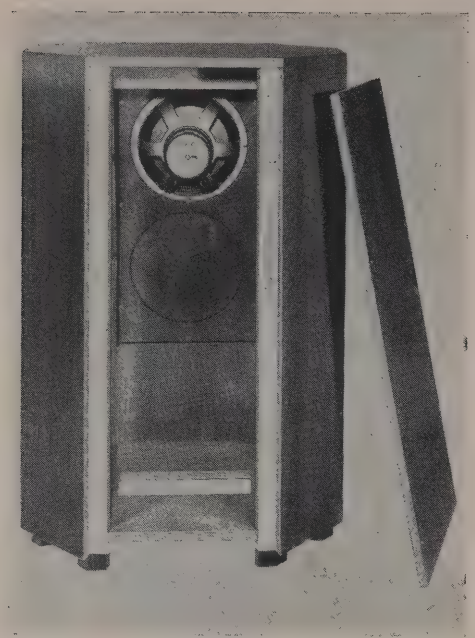
Speech coil impedance: 4 ohms at 400 cps. (An auto-transformer, BCS 1855A, is available to match 1, 2 or 3 speakers to 15 ohms).

The effective working frequency range of the loudspeaker, the BCS 1851, is 30 c/s to 20 kc/s. A typical response curve is remarkably free from resonant peaks. The average excursion in the range 30 c/s to 17 kc/s is within $\mp 2\frac{1}{2}$ db with a maximum excursion of ∓ 6 db. The wide response and low intermodulation makes it unnecessary to use a twin speaker system with changeover frequency separating network.

The metal cone loudspeaker will sell at £9.

THE OCTAGONAL CABINET

The metal cone loudspeaker is a precision instrument and in order to obtain correct operation, it is essential to load it correctly by using a properly



matched acoustical chamber. The G.E.C. Research Laboratories Acoustics Section under Mr. F. H. Brittain, have designed such a cabinet, incorporating new principles which enable an extremely good bass response to be achieved in a small cabinet.

The cabinet is octagonal in shape with narrow sides which confer rigidity without making the equipment excessively bulky. A port is provided in the base of the cabinet and this is tuned by its spacing from the floor. As seen in the booklet mentioned, the bottom of the cabinet is spaced about 1 in. from the floor, this being suitable for most floor surfaces.

As the loudspeaker is small it can be readily moved about in the living room, to obtain different acoustic effects. It can be operated with the loudspeaker facing the listener, when the reproduction simulates the effect obtained when sitting near an orchestra, or the sound can be reflected against a wall to give effect that would be obtained at the back of a concert hall.

For the best results no grille should be used but if some form of grille is required by the listener then this should have apertures of not less than ⅛ in. diameter.

The cabinet is 30 in. high, 20 in. wide and 14½ in. deep.

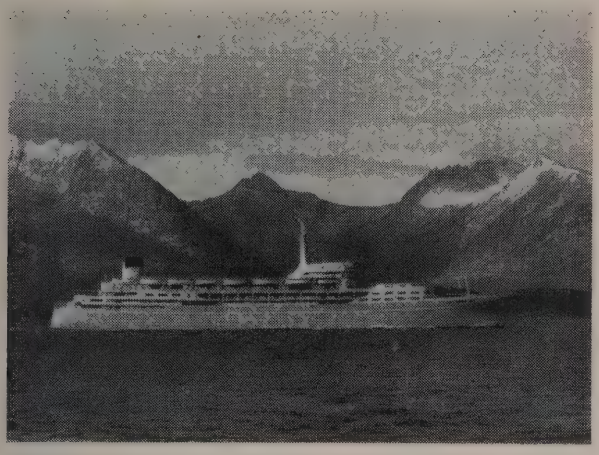
P.B.A.

WIRELESS APPARATUS IMPORTS

The following return shows particulars of certain wireless apparatus entered for import into New Zealand during the 12 months ended 31st December, 1954.

Item and Country of Origin	*Number*	£(N.Z.)
Transformers for Receiving Sets		
United Kingdom		5,272
Australia		107
Netherlands		673
U.S.A.		169
Total		£6,221
Valves for Receiving Sets		
United Kingdom	250,551	59,604
Canada	1,874	526
Australia	77,656	14,606
France	95	31
Germany—Western Zone	4,600	958
Netherlands	325,428	66,025
U.S.A.	23,251	9,130
Totals	683,455	£150,880
Valves for Transmitting Sets		
United Kingdom	6,209	27,636
Australia	27	637
Germany—Western Zone	72	15
Netherlands	285	578
U.S.A.	2,767	5,265
Totals	9,360	£34,131
Receiving Sets, Built up but Not Mounted in Cabinets		
United Kingdom	74	2,901
Australia	31	5,537
Totals	105	£8,438
Receiving Sets Mounted in Cabinets		
United Kingdom	539	15,187
Germany—Western Zone	8	67
Netherlands	11	179
U.S.A.	12	158
Australia	34	3,988
Totals	604	£19,579
Transmitting Apparatus—Other than Valves		
United Kingdom		28,809
Australia		13,585
U.S.A.		233
Total		£42,627
Other Wireless Apparatus		
United Kingdom		281,678
Union of South Africa		21
New Zealand		53
Australia		68,765
Denmark		1,054
France		2,432
Germany—Western Zone		7,835
Italy		2,547
Netherlands		31,494
Sweden		5,369
U.S.A.		13,483
Total		£414,731

s.s. "SOUTHERN CROSS"



Revolutionary in design, and fitted with the latest in radio, navigational aid, and public address equipment, the new Shaw Savill liner, s.s. "Southern Cross," is to make her maiden visit to New Zealand this month.

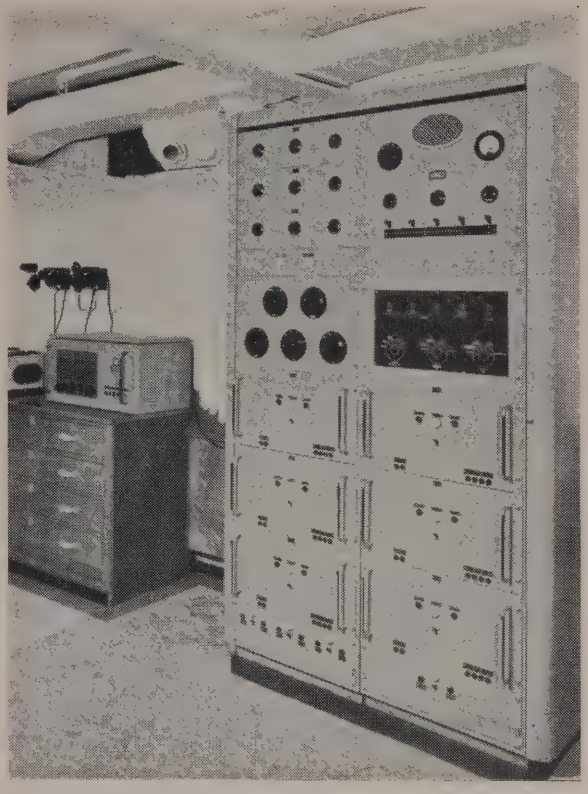
To aid navigation in all weather conditions, "Radiolocator IV" radar, a "Lodestone" direction-finder, and a "Visagraph" echometer have been installed by the Marconi International Marine Communication Co. Ltd. The "Radiolocator IV" will provide a watch on all above-water objects within a range of at least forty miles from the vessel, while the "Visagraph," a combination of the well-known "Seagraph" recorder and "Seavisa" visual-indicator, will plot a contour graph of the sea-bed or give instantaneous spot readings of the depth of water beneath the ship's keel. The "Lodestone" long-range radio direction-finder has gyro-compass stabilization, so that radio bearings on coastal radio-beacons or on the transmissions of other stations can be read direct from the dial without calculations being necessary.

The "Southern Cross's" main telegraphy system is a "Worldspan," the most powerful in the Marconi marine range. Operating in conjunction with its associated "Mercury" and "Electra" receivers, it provides communication facilities with other ships and shore stations in all parts of the world. For emergency purposes, an "Alert" guard receiver and a medium-wave "Reliance" transmitter, with automatic keying facilities, have been provided also.

A "Salvare" radio transmitting and receiving station is fitted in one of the ship's motor lifeboats, while a "Salvita" portable lifeboat transmitter/receiver is also supplied for safety-of-life-at-sea purposes. A "Seaguard" automatic alarm receiver fitted in the radio room actuates a warning bell system should the special auto-alarm distress signal be received when there is no radio officer on watch on the distress frequency.

SOUND REPRODUCING SYSTEM

The MIMCO sound-reproducing and order system ranks among the largest fitted on board ship, and feeds a network of 200 loudspeakers situated in passenger and crew spaces, providing news, entertainment items, and facilities for announcements and orders.



The amplifier cabinet of the MIMCO sound-reproducing equipment installed on the "Southern Cross". To the left is the MIMCO receiver with, beyond it, the tape-recorder.

The nucleus of the system, fitted in a special sound-reproducing equipment room adjacent to the radio office, comprises a totally-enclosed double-bay amplifier rack cabinet, a MIMCO broadcast receiver, and a tape recorder for recording news and other programmes of interest which may be received at times inconvenient for diffusion over the loudspeaker system. Such programmes can then be played back at a more suitable time. A separate gramophone room near the vessel's cinema lounge houses a three-speed double-turntable gramophone unit, and a single-turntable record player is installed in the tavern.

The amplifier rack cabinet contains three pre-amplifiers, six power amplifiers each having an output of 60 watts, input and output switching and monitor unit, and relay and auxiliary power control panels. The amplifier assembly takes inputs from microphones, broadcast receiver, the two gramophone units, and the tape recorder, and switching permits these inputs, after amplification, to be connected to the appropriate groups of loudspeakers. Two of the three pre-amplifiers are used for announcements only, while the third may be switched to any one of six microphone positions in different parts of the ship.

Of these microphone positions, two situated in the chartroom and reception office are fitted with master control facilities and have over-riding priority in the order named. That is, the microphone in the chartroom, when switched into circuit, will automatically take over loudspeaker groups in either the passenger or crew spaces, or in both if desired, cutting out any other programme which may be on at the time, while that in the reception office acts in the same way over loudspeakers in the passenger spaces only.

The loudspeaker network is divided into two main groups—"Passengers" and "Crew"—each of which is again split into two subsidiary groups—"Passenger Announcements and Entertainment" and "Passenger Announcements and Meal Calls," and "Crew Orders and Entertainment" and "Crew Orders." The greatest care has been taken with the siting of the loudspeakers so as to achieve a smooth level of audibility over a wide area and at the same time to avoid too high a volume in the immediate neighbourhood of any of the loudspeakers. Careful blending of loudspeaker fitments with the decorative schemes in which they are placed renders them as unobtrusive as possible.

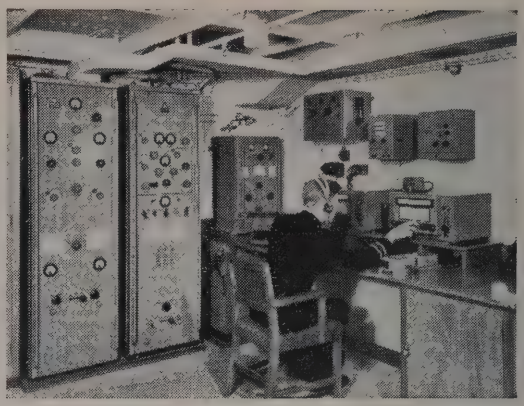
THE CLAVIOLINE

Solving the problem of catering for a wide variety of taste in musical entertainment is the Clavioline, installed on the "Southern Cross" by H. Selmer & Co. Ltd., of London.

This self-contained unit, which packs with its own amplifier into an attache-style case, is connected to the mains supply just like a radio.

The Clavioline is an electronic keyboard which can be attached to the piano and played by the pianist's right hand. It can be employed as a solo instrument if so desired. By manipulation of tabs similar to those on an organ console, faithful reproductions of all orchestral instruments can be played on the electronic, piano-style keyboard.

No doubt, by this time, readers have definitely made up their minds to have a trip on the "Southern Cross" at all costs, so we shall refrain from further description for fear of increasing too greatly the already long waiting lists for passages!



"Southern Cross" radio officer turning "Mercury" Receiver. Left to right, other equipment shown comprises "Worldspan" main transmitter, "Reliance" emergency transmitter, "Electra" receiver, "Alert" emergency receiver, and "Autokey" automatic keying unit.

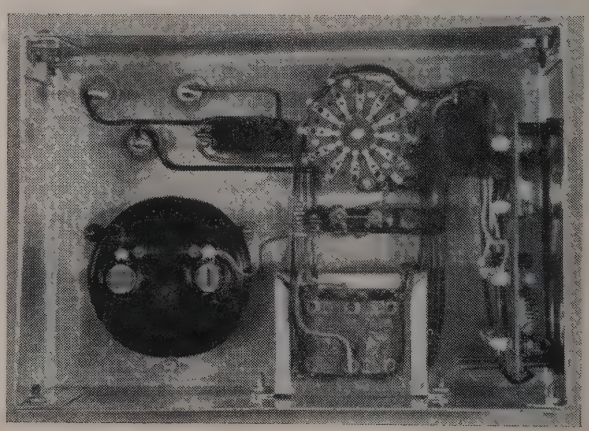
BOOK REVIEW

Radio Laboratory Handbook (6th Edition) by M. G. Scroggie, B.Sc., M. I. E. E. Publishers, Iliffe & sons Ltd., London.

Anyone who is familiar with Mr. Scroggie's work will need no introduction to his "Radio Laboratory Handbook," nor will he need to be told that this sixth edition, much enlarged and modernized compared with the previous one, is almost a "must" for anyone who takes his measurements seriously. Not that Mr. Scroggie has departed from his usual freshness of approach, or descended towards the solemnity of most professional text books. He has not, with the result that the sixth edition retains the strict accuracy and freedom of pedantry for its own sake that characterized its predecessors. Perhaps this is just a long-winded way of saying that the author's work is, as always, impeccable from the strict scientific point of view, and at the same time, eminently readable. Indeed, to our way of thinking, it is difficult to find a higher compliment than this for the author of a textbook, whatever his subject. Anyone whether an amateur experimenter of a professional engineer, will be able to find much to interest him, and much that is instructive in this book, not to mention many methods and recommendations that will save both time and money. The author's hope that both classes of reader will find a use for the volume should be amply fulfilled. The only criticism we would make is that the chapter purporting to indicate how normal methods of measurement are extended to very high frequencies is somewhat sketchy. Perhaps the author would have been better to omit this altogether, as he has done with microwave techniques, on the score of the highly specialized nature of the work, and the extensive separate literature on the subject. This is really a very minor matter, however, for the value of the book is more than anything else due to its approach from fundamental principles, and the inclusion of specialized techniques would not really have been in keeping with the scope of the work.

OUR COVER

We have been asked to print photographs of the completed prototype of the audio output meter whose design was described in last month's issue of R. & E. The cover shows the external appearance, while the small photograph below gives an idea of the internal construction. The built-in load resistors are mounted on an insulating panel which is vertical in the photo, and does not show up very well in consequence. The transformer can be seen in front of the main switch. The meter rectifier is mounted on the piece of insulating terminal strip between the transformer and the switch.



RECORD TALK

By JOHN GRAY

The Delta Trading Company, who handle the local distribution of Nixa records, announce a variety of releases in their latest bulletins. They have secured, for example, the famous "Sounds of our Times" recordings made by Emory Cook of Boston—a gentleman who has experimented long and successfully with recorded sound. He is unashamedly out to catch the attention of the hi-fi addicts: who would have thought the day would come when the public would be offered a disc containing on one side, a recording of a summer thunderstorm and, a collection of train noises? Such things have never before existed outside "sound effects" libraries. I understand another is on the way capturing the result of a recent "recording session" wherein microphones were lowered into the depths of the ocean. Record collectors are assured, however, that plain music also attracts Mr. Cook. He has persuaded the veteran organist, Reginald Foort, to star in a series of discs of his favourite numbers (Nixa SLPY 148, 156, 159), and there is an astonishing performance by one Red Camp and his "derelict piano, nicely out of tune" on SLPY 144. But there is nothing freakish about some standard pieces played by the "New Orchestral Society of Boston" under Willis Page. They are a highly efficient group and are, as likely as not, members of the Boston Symphony. One of their offerings, on an extended play 45 (45EP 651) couples performances of Honegger's once notorious railway train saga, "Pacific 231" and Samuel Barber's deeply impressive "Adagio for Strings."

Nixa have to their credit the first LP disc by the New Zealand bass Inia Te Wiata, who is accompanied by Ernest Lush (NLP 915). The singer has confined himself to ever-welcome old favourites such as "Myself when Young," "Songs my mother taught me," "Oh could I but express in song," and others in the same vein, of which there is always room for up to date versions now that the old standard 78's are dissppearing so fast. Nixa's main classical catalogue has always concentrated on musical rarities and thus we find in their latest listings the entire set of Beethoven's Bagatelles, played on CLP 1199 by a fine pianist, Grant Johannsen. A symphony in C major by Dukas reminds us that this composer wrote at least something other than the eternal "Sorcerer's Apprentice." The symphony is a big, expansive work, issued in a fine French performance on ULP 9102. Giordano's vivid opera "Andrea Chenier," staple fare in Italy but almost unknown elsewhere, could be guaranteed success with anyone who warms to Puccini and Mascagni. Try this lusty performance by a Rome opera cast on three records (Set ULP 9218). The Delta company are also offering some of the English line of "Argo" records ranging from one of John Ireland's piano music played by Eric Parkin (RG 28) to a disc on which Esme Percy gives his reminiscences of Sarah Bernhardt (RG 38). Finally we might mention an extensive list of Nixa extended play 45s both popular and classical and including several items culled from their vast opera catalogue.

Radio corporation are still concentrating on their ace attraction, Nat "King" Cole. Many single discs have appeared of late, and now comes a whole 12 inch LP containing sixteen previously unreleased numbers by this most seductive of singers, whose honeyed style somes as a restful change from the antics of today's screamers and shouters, who practically monopolise the popular vocal market, Cole's disc, labelled "Tenth Anniversary Album" and numbered Capitol CLP 502, provides both restful and satisfying entertainment. And of more recent hits, there is the usual crop from Capitol. "Woman's World" is done by Ray Anthony on CP 373, "I need you now" enlists the combined talents of Les Paul and Mary Ford on CP 381, "My son my son" is a vehicle for Margaret Whiting on CP 382, "The Finger of Suspicion for Jane Froman on CP384." It may be considered a little late to bring forth a coupling of "Sh-boom" and "C'est si bon," which have just turned up on CP 388; we have but to whisper that Stan Freberg is the "artist" and everyone will know what to expect and the edition will probably sell out. On Tanza our own entertainers are represented in a new offering from a popular team, Daphne Walker with Bill Wolfgramme's Hawaiians. One side of Z 242 contains the perennial "My Isle of Golden Dreams," the reverse is a current novelty "Hootchy Kootchy Henry from Hawaii," which is as bright as the name would indicate. Among the Capitol Classics we note a brilliant performance of the Gershwin Concerto in F by Leonard Pennario and the Pittsburgh Symphony under Steinberg (CLC 036).

There is attractive entertainment in the latest batch of Festival records. On an extended play 45 (XP 45-477) that favourite artist Frank Luther sings no fewer than twelve children's songs. There are 10 inch LPs of popular standard material by the Ames Brothers (CFR 10-484), Percy Faith, with vocals by Hildegarde (CFR 10-512) and the former Ink Spot soloist, Bill Kenny, who sings now with the Gordon Jenkins orchestra and chorus (CFR 10- 557). And Festival have some unusual titles in the sphere of serious music. Few people can previously have been on intimate terms with Paganini's String Quartet in E major, which makes its appearance on CFR 10-605, or Auber's "Masked Ball" Overture, which shares CFR 10-602 with the very much better known "Merry Wives" of Nicolai. Likewise Humel's Septet, played by Viennese artists on Westminster WL 5018, gives us a rare opportunity of coming to terms with the music of a man who was not merely a contemporary of Beethoven's but was considered by most people in those days to be superior!

Festival are also cashing in on the interest aroused by the current tour of the French singer Jean Sablon, and eight of his numbers are collected on CFR 10-353. Paul Baron's orchestra provide the background for Sablon as he sings favourites of both French and Anglo-American audiences—the latter group are catered for with "Symphony," "It Might as well be Spring" and "These Foolish Things." The Andrews Sisters take us to Hawaii on CFR 10-383, and there is a further selection of fiery tunes from the orchestra of Antal Kocze, "King of the Gypsies." on WL 3004.

Philips are maintaining their position in the popular field with new issues by artists like Jo Stafford, whose new couplings include "A Fool Such as I" and "Just Because You're You" (B 21000), and "Teach me To-night" with "Suddenly" (B 21454). At the time of writing Rosemary Clooney has the field to herself (though Dean Martin is coming up on Capitol) with one of the latest manifestations of the Mambo craze, "Mambo Italiano." It shares Philips B 21465 with "We'll be Together Again," which is soothing, if not more exciting. Frankie Laine is back again with "Old Shoes" and "In the Beginning" (B 21497) and the inescapable Liberace manages to condense Chopin's Polonaise (guess which) and a certain Moonlight Sonata, each on to one side of B 25419.

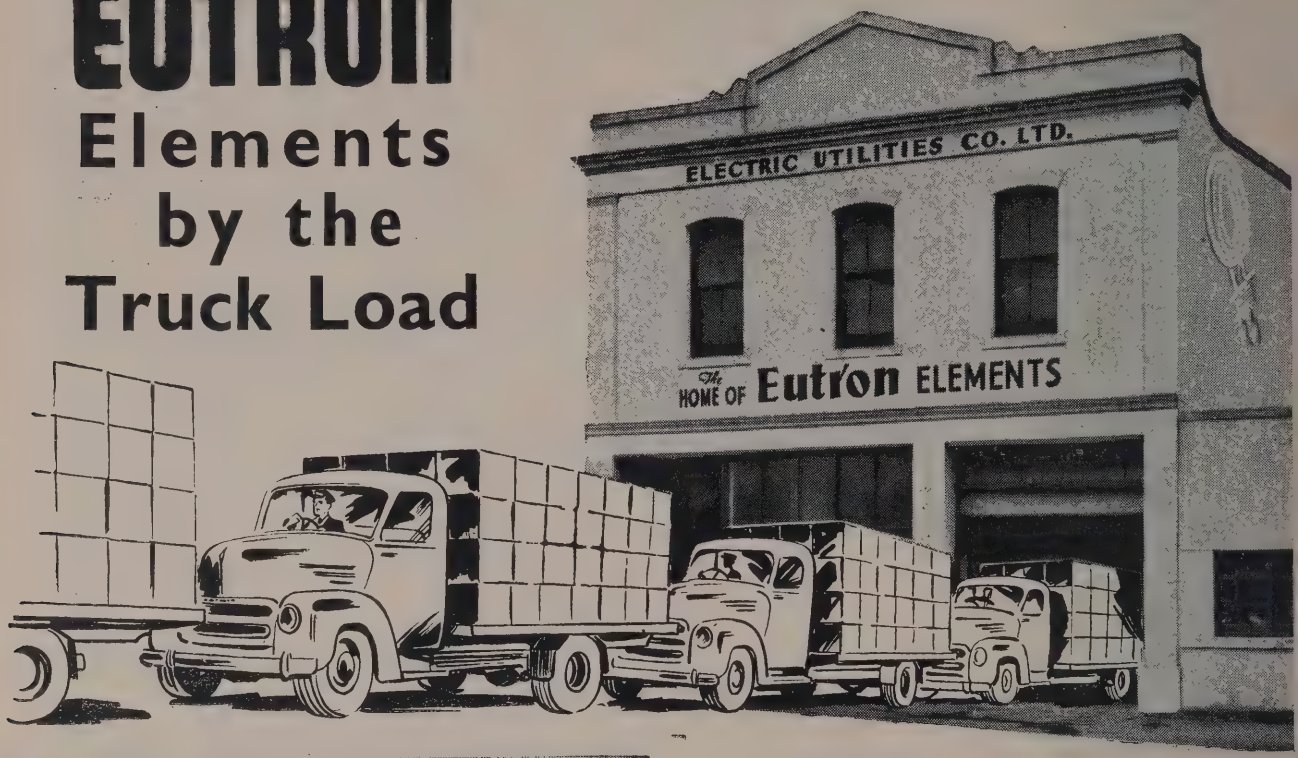
The first list of Philips classical LPs ("Minigroove" is their particular designation) has also been announced. This company have arrived late in an overcrowded field, and with the best will in the world it is hard to wax enthusiastic over yet another Tchaikovsky No. 5, Beethoven "Eroica," and Brahms No. 4, even though by the most distinguished of orchestras and conductors, as these new ones undoubtedly are. Rather are we tempted towards rarities unobtainable on any other make of record, and this leads us straight to the ace attraction of this Philips release—the Berlioz Te Deum, in an inspired performance under Sir Thomas Beecham (ABL 3006). This combination of orchestra, double choir, boys' choir and organ makes a thrilling enough sound in itself and when allied to the noble music of Berlioz the result is irresistible. The Te Deum is a grand and satisfying composition and becomes here a triumph for both performers and engineers. I have rarely heard such superbly placed and wonderfully recorded cymbal clashes, though of course there is much more to the music than that. A landmark in choral-orchestral recording. Rudolf Serkin and the Philadelphia Orchestra give a fine, tense rendering of Mozart's great concerto in D minor—the first LP release here of one of the most frequently played of Mozart's (ABR 4006, 10 inch). The cadenzas Serkin played for this recording were composed by no less a one than Beethoven. Two bright sinfonias by J. C. Bach are expertly done by the Vienna Symphony under Paul Sacher on ABR 4005, and the Saint Saens frolic, "Carnival of the Animals," is given by Andre Kostelantez and his orchestra on NBR 6001. There are existing and forthcoming performances of this piece by much more famous conductors and orchestras, but what sets the Philips version apart from all the rest is the inclusion of a delightfully droll set of verses written by Ogden Nash and recited with just the right approach by the imperturbable Noel Coward ("Camille. Saint Saens was racked with pains when people referred to him as Saint Sains"). These must be heard to be believed and will be a source of continual entertainment.

H.M.V. have offered their "Papa Loves Mambo" in the hit parade version by Perry Como (HR 10042), while Gary Crosby (a chip off the old block) is first off the mark with a variation called "Mambo in the Moonlight," which he sings, together with "There's a Small Hotel," on Col. DO 70149. There is always a welcome for such old timers as "By the Light of the Silvery Moon" and "Isle of Capri," newly done by Jackie Lee's orchestra on DNZ 1. This new Columbia "DNZ" series, by the way, is obtained mainly from the American

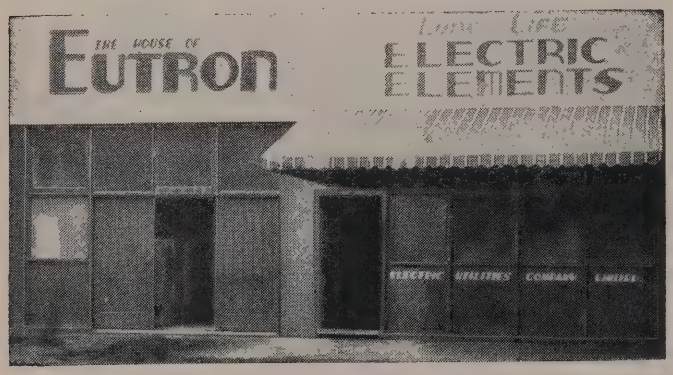
(Continued on Page 49.)

EUTRON

Elements by the Truck Load



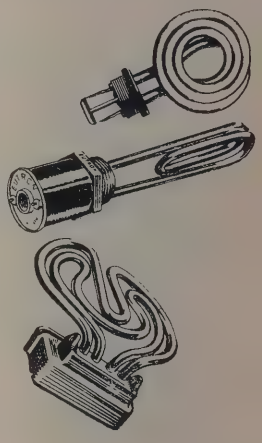
ABOVE: The new Eutron factory in College Hill which will become the main manufacturing plant and headquarters of Mr. J. Nicholson (Eutron Nick) Managing Director of the company.



ABOVE: The original factory in Grey Lynn where production will continue of special types of elements.

All types for WATER, OIL, AIR, RANGE

It's all happened in only nine years! From a mere handful of Jug Elements daily, the output of the now extensive Eutron organization has grown to thousands per week of not one type of element only, but to hundreds of types from two factories. The big demand from both commercial and domestic users is clear evidence of Eutron's superiority and reliability . . . proof that Eutron reflects the highest degree of technical skill and laboratory research necessary to the maintenance of standards of manufacture second-to-none! Electric Utilities can quote and deliver elements for practically any application.



ELECTRIC UTILITIES CO. LTD.

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316, GREAT NORTH ROAD, GREY LYNN W.2., AUCKLAND

ELECTRICAL AND TRADE SECTION

RADIO FREQUENCY HEATING IN INDUSTRY

By a "FINANCIAL TIMES" CORRESPONDENT

(Reprinted from "The Financial Times," 11th October, 1954)

Radio and raincoats seem a world apart. Yet today many plastic mackintoshes are advertised with welded seams which have been made by radio frequency heating. Some of the food we eat has had its moisture content reduced by radio frequency treatment; and the turret races of the modern army tanks are today hardened by radio waves. This revolutionary method of heating developed very quickly during the war, and during the past ten years its use has become general in a large number of industries.

When the public first became aware of the potentialities of radio frequency heating—about the time of the first world R.F. Heating Exhibition held by Redifon in London in 1945—there was a tendency to credit it with powers then well beyond its scope. The belief that it would revolutionize cooking methods had a strong appeal: there was the attractive possibility that perfectly cooked joints would be cooked by radio in a few minutes. We are still using gas and electric ovens; but the idea of rapid cooking did reflect the essential advantage of radio frequency heating—its power of speeding up heating processes to a fraction of the time taken formerly.

COMPLETELY AUTOMATIC

Radio-frequency heating is basically a method of producing at great speed heat capable of acting on a finely-defined area. Just as radio waves transmitted from a broadcasting station are converted into sound, so the radio frequency waves are converted into heat. Most radio frequency heating installations are completely automatic and give very accurate control. Already its application has made it possible to reduce overall production costs and apply changed production methods in new or long-established industries.

So far the equipment made has been designed for two broadly divided applications—for use in the engineering and metallurgical industries and for use in a wide variety of industries dealing with non-metallic materials. For hardening, annealing, brazing and soldering—the many complex processes necessary for working metal—radio frequency heating is done by induction heaters. The first relatively simple equipment was used for the hardening of steel knives or blades; from this have been developed generators with power outputs of from 1 kw. to 200 kw. Induction heaters are now being used by motor-car manufacturers in the mass production of tanks and aeroplane engines, guns, and ammunition.

Even wider fields have been found for the application of radio frequency heating to non-metallic dielectric materials; when metals are heated by radio frequency energy, the energy is transferred by induction and heats the outside of the material. When a dielectric material is acted on by radio frequency waves it is uniformly heated throughout. The leading users of radio frequency heating of this form are the plastics and furniture industries.

Photograph showing the conveyor specially constructed for dealing with about 160 bread rolls of a special nature per minute. The 10 kW radio frequency generator shown on the right feeds the power through the coaxial cable (shown rising vertically) to the electrode system and load matching device accommodated in the back of the electrode housing.

During the passage of the rolls between the R.F. electrodes, their moisture content is reduced from about 19 per cent. to 9 per cent. in 15 seconds. The moisture forcibly driven out of the rolls by the radio frequency current is carried off by a counter current of warm air flowing over the rolls from the fan and heater element shown in the top centre of the photograph. The moist air is carried off through the ducting attached to the far end of the electrode housing. The electrodes operate at about 15,000 volts.

Dielectric heaters are used for the rapid setting of synthetic glues, the pre-heating of plastic moulding materials and laminates, and for dehydrating food. Its use has been particularly successful in industries where formerly the time needed to assemble and glue together various components slowed down the entire production process. By applying heat locally to a glued-up assembly, the adhesive may be set in a matter of minutes or even seconds, instead of hours. In addition, the number of jigs employed can usually be reduced to as few as two, thus effecting a considerable economy in floor area.

MORE PRODUCTIVITY

In general, high-frequency heating has already led to greater productivity in a wide variety of established industries, where its cleanliness, its time-saving advantages, and its simplicity have proved its economic worth. The radio frequency heating industry, however, is still in its early stages; experiments now being made may well bring about its extension into completely new spheres.

For example, the possibility of using radio-frequency

(Continued on Page 50.)

REFRIGERATION—Part II

(Published through the Courtesy of the publishers of "The Practical Electrician's Pocket Book, 1955.")

IMPEDANCE TUBE

It is usual in "sealed" types of unit to eliminate working parts that are likely to need adjustment, and thus we find float valves and expansion valves discarded in favour of the simpler impedance or capillary tube method of refrigerant control. The impedance tube meters liquid refrigerant from condenser to evaporator in exact quantities required; the length varies with cabinet size and refrigerant being used, the orifice being in the neighbourhood of 0.030 to 0.040 in. for Arcton 6 refrigerant. The small diameter of the tube, through which liquid refrigerant passes by capillary action, reduces the pressure on the liquid passing through the tube, and this, in turn, reduces the temperature to an amount predetermined by tube length. With a correct refrigerant charge, the balanced pressure observed during an idle period of the compressor should correspond to the evaporator temperature given on a pressure-temperature chart for the refrigerant being used.

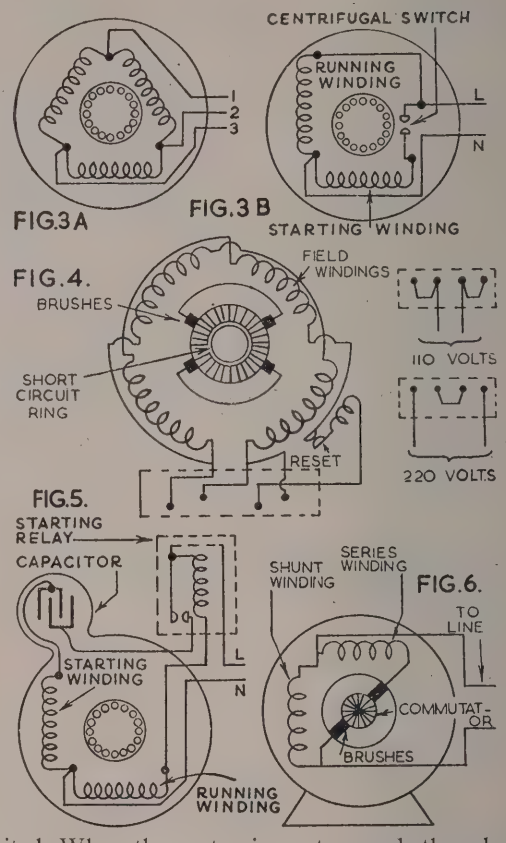
Should refrigerant vapour at any time during the cycle begin to pass from the condenser into the tube, the flow is automatically retarded because the small orifice offers considerable resistance to the flow of vapour, but little to the flow of liquid. When head-pressure is equal to suction-pressure, the compressor can be turned over easily by a motor with a low starting torque, enabling the split-phase motor to be used on a relatively low starting current, a characteristic of the impedance tube system being that the high-side and the low-side pressures equalize on the off-cycle, eliminating the need for easy starting devices.

If, during testing, the unit is switched off, two or three minutes should be allowed before switching on again for the pressure to equalize, otherwise the unit will probably cut out on overload.

An improved performance is obtained in this system by the simple expedient of soldering the impedance tube to the suction line for a portion of the length, the principal purpose of this heat exchange being to increase the overall efficiency of the system by cooling the hot condenser liquid from the condenser with the relatively cold refrigerant vapour leaving the evaporator.

(7) Motors.—There are several types of A.C. and D.C. motors used for refrigerators. On large refrigerators three-phase A.C. induction motors are used which are self-starting (see Fig. 3a). On smaller units, single-phase A.C. induction motors may be used; these are provided with an additional starting (or split-phase) winding which is out of phase with the main running winding (Fig. 3b). The starting winding is cut out automatically by centrifugal switch when the motor is up to speed. It is more usual today to use a capacitor or condenser in series with the starting winding to increase the starting torque; these are known as capacitor-start induction motors (Fig. 5). In sealed units, the starting winding is brought into action by a relay.

A repulsion-start induction A.C. motor has an armature and commutator like a D.C. motor (Fig. 4). The stator winding only is supplied with A.C., the brushes on the commutator being permanently short-



circuited. When the motor is up to speed, the whole of the commutator segments are automatically short-circuited, turning it into an induction motor. The brushes are also lifted off the commutator surface. This type has a high starting torque owing to its repulsion characteristics with a low starting current.

Shunt-wound and compound-wound motors are used only on D.C. in view of the constant speed characteristic required (Fig. 6).

Overload switches are generally fitted to refrigerator motors to protect the windings from overload and overheating. A.C. refrigerator motors when running at full speed do not cause radio interference. D.C. motors, however, need suppressors in circuit at all times to prevent radio interference.

(8) Thermostat or "Cold Control."—Many different makes of thermostat will be found on domestic refrigerators, but all work on more or less the same principle. A bulb containing a liquid or gas vapour is mounted in contact with the evaporator, and a small-bore capillary pipe leads to a bellows in the thermostat (Fig. 7). The evaporator temperature causes the liquid or gas vapour to expand, or contract, and operates the switch controlling the motor. A manual control is arranged to increase or decrease

pressure on the bellows, thereby determining the temperature to which the evaporator temperature is allowed to rise or fall before switching the motor on or off.

In some installations, a "low pressure control" is used instead of a thermostat to control the temperature of the evaporator or refrigerated space. This operates on the pressure in the evaporator, but is usually fitted to the frame of the condensing unit, and is connected by tubing to the low-pressure side of the system.

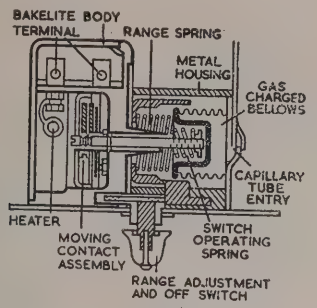


Fig. 7—The thermostat ("cold control") or heat-controlled motor switch.

An increase in pressure in the evaporator, indicative of a rise in temperature, causes the switch controlling the motor to close and so starting the plant. A decrease in the evaporator pressure will conversely open the switch and stop the plant. This type of control cannot be used in conjunction with the "automatic" type of expansion valve.

INSTALLATION AND OPERATION

The success or failure of a refrigerator system depends largely on the correctness of its installation. Therefore when completely installed, the engineer should make sure everything is in perfect operation before leaving the site.

Domestic refrigerators generally arrive assembled and tested. When a suitable location has been found, one where the refrigerator is not likely to receive appreciable heat, and where there is a good air space behind the condenser the minimum three inches) with a free supply of cool air, all that has to be done is to check the supply voltage, etc., and open up the service valves if any. There are usually labels indicating which valves are closed. The engineer should make sure that the live line goes through the cold control first, then plug in to supply. In the case of an hermetically sealed unit, it should be determined that the air supply is unobstructed and that any shipping blocks fitted by the manufacturer are removed. Installations of commercial units can be a much more intricate problem, as the units are often sent separately and have to be installed individually. There are of course the pipe lines to run and clip up. When installing commercial units the following conditions are most desirable. The condensing unit should be located on a level which is cool, dry, clean and well ventilated, not far from the cabinet, and in a position accessible for any service work. It should not be placed directly under or over a bedroom, or in any place where the temperature will be below 30°F. in winter. The evaporator should be fitted with any baffles which may be necessary to give proper air circulation, and the expansion valve should be placed as near to the evaporator as possible. Pipe lines are run in soft annealed copper tube, and the joints are made by flaring the end of the pipe, this must be done with a special tool, together with refrigeration fittings.

During the time taken to instal a plant great care should be taken to prevent entry of dirt and moisture into open ends of piping. Piping should be sealed as soon as possible after cutting and when not in use.

MAKING READY

After the refrigerant connections have been made the whole system must be purged of air. This is usually done by cracking the valve of the liquid receiver outlet, leaving the last flared joint on the suction valve of the compressor slightly open. The refrigerant, passing from the liquid receiver, forces the air out of the refrigerant lines and coil, and out of the flared connections on the suction valve of the compressor, and this should be tightened as soon as all the air has been forced out. In the case of a flooded coil, this is usually sent out charged with refrigerant, and the suction and liquid lines must be purged separately.

Before starting up all joints should be tested for leaks, this test varying with the type of refrigerant used:—

Sulphur dioxide (SO_2)—test with a solution of ammonia: dense white smoke indicates the presence of SO_2.

Freon and Methyl-chloride—a special alcohol-burning halide torch is required to test the leaks with these refrigerants, as they are both practically odourless; the flame turns green in the presence of either gas.

Test run. If no leaks are found, open all valves by backing valve stems out, turn temperature control to normal position, and allow unit to operate continuously.

NORMAL OPERATION AND MAINTENANCE

Defrosting. With plants that are fitted with "defrost" on the off "cycle not much trouble is experienced, unless such things as overloading the cabinet with produce occurs, or the door is left ajar, when frost will build up rapidly on the coil. This has a definite effect on the heat extraction of the coil, for this accumulation of frost acts as a blanket round the coil and greatly impedes the heat extraction. All refrigerators should be defrosted at least once a week (except wth special low-temperature refrigerators where this is not possible); frost should never be allowed to build up to a depth of more than a quarter of an inch. If this is not done consumption rises, due to long running of the plant, produce is not properly refrigerated and wasteful wear and tear occurs.

Normal Maintenance. Maintenance visits in the case of commercial plant are usually carried out at three monthly intervals, when the following checks should be made. The motor should be oiled, belts checked for wear, compressor oil level checked, wiring inspected for loose connections, and condensing unit cleaned.

(To be Continued.)

In several overseas countries great interest is being shown in demonstrations of the new Auto-timer cookers, and the fact that several "clock" radio receivers are now available there points the way to a new market. We are therefore indebted to the English journal, "Wireless and Electrical Trader," for permission to reprint the following article, for, in a year or two, the New Zealand public also will have come to realize that many of their domestic appliances are much more useful and convenient if time-controlled. Therefore, the manufacturer and dealer with an eye to future developments will not be slow to prepare for the . . .

TIME TO SELL TIMERS

The relatively recent introduction of electric cookers incorporating automatic time controls may very well awaken public interest in a product which has until now remained obscure so far as domestic applications are concerned—the electric time-switch.

No one who has seen a demonstration of one of these auto-cookers will doubt that they will come to be in considerable demand and will confer a great boon. They place the electric cooker far ahead of its rivals.

In Britain it is not essential for the housewife to buy a new cooker to have automatic control, for she can have a time switch fitted; and there are other applications of these switches which will assist busy householders, or increase their pleasure.

Naturally, however, many people are ignorant of these possibilities, and need advice. The dealer who makes himself familiar with the varying types of timer units now available will be in a position to cater for and develop a market which at present is virtually untouched. The fact that this season has seen the introduction of several, "clock" radio receivers with built-in timer switching is a further indication that "time control" has sales possibilities.

Industrial consumers seek and even devise improved methods, but housewives need leading in such matters. Once they understand what can be done, it should not be difficult to convince those who are able and enterprising that the adoption of the time-switch will provide many advantages. They might begin by converting an existing cooker.

TYPES AVAILABLE

Although the range of available models, excluding industrial types, is not so great as could be desired, there is a fairly good choice. For domestic use, appearance and simplicity of operation are important, and for these reasons the normal industrial models are not the most suitable.

Those designed to control ovens, for example, are attractive, and are usually set by a simple movement, such as turning a knob and a dial, This starts the timing mechanism, and the actual knob and dial settings chosen determine how many hours shall pass before the oven is switched on and how long cooking shall continue. Heating may follow setting at any selected time up to, say, fourteen or perhaps twenty-four hours later. The single on/off action is satisfactory in this case, but time-switches can be obtained which will switch on and off many times in the day, as required. A more simple model has one action; it switches on, or off, after a pre-set period. Still another controls two circuits. Time-switches can be cut out of circuit when not required.

PORTABLE TYPES NEEDED

Timing is governed either by a synchronous motor or a hand-wound mechanism. Some controls must be wired permanently in the one circuit controlled. For many purposes a more portable design is desirable, unless a separate switch is to be installed for every new application at a somewhat prohibitive cost. There is a more portable model which incorporates a two-pin, 10-A-socket-outlet. It may either be wired as a fixture or connected by a lead and plug to an existing outlet. It was designed as a radio programme pre-selector, and as such should run continuously like a clock. If it is moved from one socket-outlet to another, the clock timing will need attention. Even so, it may be regarded as a near-portable instrument, and will in any case control whatever apparatus is plugged into its own socket-outlet.

The cooker-control has already been referred to. It will enable the housewife to go shopping, to business, or to church, etc., and arrange that a meal is cooked and hot ready for her return.

The radio programme pre-selector may be set daily to provide just those programmes which are wanted, and it will ensure that they are not forgotten. Such a control has a particular use where there is a loud-speaker extension in a bedroom or sickroom.

An economical use is in a water-heater circuit. A thermostatically controlled immersion heater will seem too expensive for many people in spite of storage tank lagging. If a time switch with a repeating cycle is fitted, it may be made to heat the water first thing in the morning, and again at any periods during the remainder of the day. A 25 per cent. saving has been claimed, and in addition the minimum of heating can be arranged in uncomfortably hot weather.

Most people are reluctant to get up in the morning in freezing weather. Almost all would appreciate a time-switch which would switch on an electric fire a short time before it was time to rise. Similarly, most of us appreciate the welcome of a warm and cheerful room when returning home in the winter. When both husband and wife are at business, they would find it an advantage to fit a time-switch to their electric fire or convector heater.

Some manufacturers are fitting time-switches to washing-machines—more particularly in other countries. It is not desirable to prolong the period in which some items being washed are agitated in the machine, and it is easy to forget. In this case, a very simple control will serve: one which may be set at the beginning of the operation to cut off after the desired number of minutes. The same switch may be used with a sun lamp. It is well known that over-long

(Concluded on Page 50.)

NEW PRODUCTS: LATEST RELEASES IN ELECTRICAL AND ELECTRONIC EQUIPMENT

This section of our paper is reserved for the introduction of new products and space preference is given to our regular advertisers. For further particulars contact Advertising Manager, R. & E., Box 8022, Wellington.

BELCUT—THE KING OF SHAVERS

With plug-in shaving heads, the new Swiss Belcut shaver combines all the features required of the modern electric shaver.

For the smoothest shave, a screened head is used, containing a 17-blade cutter covered by a surgical steel sieve. This gives 36,000,000 cutting movements per minute. A direct-cutting comb head replaces the sieve head for the long, hard-to-get-at hairs. This head is also used for trimming the back of the neck, moustache, and sideboards, or shaving a week-end growth.

By having the choice of two types of heads, whether the beard is hard or soft, long or short; the skin rough or smooth, a clean shave can be guaranteed under all conditions.

A kit containing five assorted massage attachments is available as an extra. These accessories plug in to the shaver and turn the Belcut into a home appliance for the use of all the family.

Fully guaranteed for twelve months and presented in an attractive leatherette box, the Belcut electric shaver retails at £8 18s. 6d., complete with two heads, oil bottle, and brush.

Sole New Zealand agents are Electro-Technical Industries Ltd., P.O. Box 2359, Wellington.

* * *

TELEFUNKEN "MAGNETOPHON" KL25

Messrs. Amalgamated Wireless (Australasia) Ltd., P.O. Box 830, Wellington, and P.O. Box 1363, Auckland, have pleasure in announcing the arrival of stocks of the Telefunken "Magnetophon" KL25—the modern miracle of tape recorders.

Of compact design and attractive appearance, the KL25 weighs approximately 30 lb. It is built for mains supply A.C. 50 c.p.s., 110, or 230v., has a power consumption of approximately 75W., a single motor drive, and tape speed of 3¾ in. per second (special model with 7½ in. per second). With twin tracks on one tape, 1,140 ft., the playing time is two hours at 3¾ in. per second and one hour at 7½ in. per second. The diameter of the tape spool is 7 in. Other features include fast wind and re-wind, separate recording, play-back, and high-frequency erasing heads, and a frequency range of 50 to 10,000 c/s. (50 to 15,000 c/s. at 7½ in. per second).

There is a high-impedance microphone input for direct connection of a crystal microphone, and connection of a moving-coil microphone over its own transformer. Recording input is interchangeable: 30v. into 500,000 ohms for connection to a high-ohm second loudspeaker socket (of receiver); 1v. into 80,000 ohms for connection to a low-ohm second loudspeaker socket; as well as 50 mv. into 200,000 ohms.

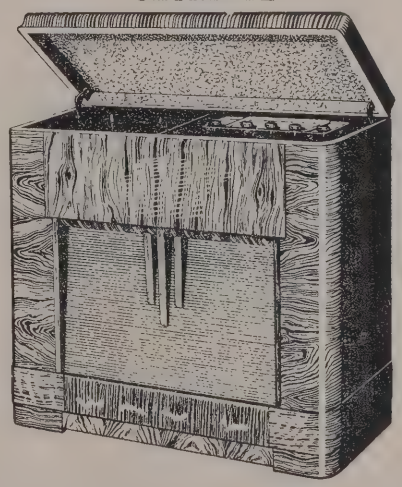
Output is 2 watts, and there is a socket for external loudspeaker of 5 ohms impedance. Reproduction output (for pick-up connection on a radio set) is 1v. for 100 kilohms or more.

The KL25 has a plug-in socket for earphone, and volume control for playback, via built-in amplifier. There is smooth, reversible switching over from microphone to wireless recording over only one control, a variable volume. In addition, there is a dictation aid (quick stop and start, short rewind), with provision for a foot-operated change-over switch, and a counter (tape distance indicator) counting forwards and backwards, with zero adjustment, for the speedy location of any spot on the tape record.

All inquiries concerning the "Magnetophon" KL25 should be addressed to Amalgamated Wireless (Australasia) Ltd. at either Auckland or Wellington.

* * *

BIG STEP FORWARD IN RADIO JOYOUS LISTENING WITH A NEW ULTIMATE



Once again, Ultimate is first with the best for the New Zealand public. New and exciting stereophonic

sound is incorporated in the new Ultimate 7-valve Bandspread Lowboy—the "Rex." Regal in many ways—in name, in appearance, and in performance, this Lowboy has many distinctive features. It has no fewer than three speakers, and they, in themselves, are something special. The two speakers that handle the low and middle frequencies have cones of low resonance (60 c.p.s.), while the high-frequency speaker (cone resonance 130 c.p.s.) is exclusive to Radio (1936) Limited.

The two larger speakers mounted close together, approximately double their radiation resistance, and it follows that their efficiency is also doubled. The speakers are fed by a cross-over network that crosses over at approximately 2,000 c.p.s. This system is not just a variation of the familiar twin speaker receiver but is a distinct technical advance. In conjunction with this there is a hi-fi switch, and new listening pleasures are available on both radio and record reproductions, particularly the latter.

The dial is the clearly marked and colourful prize-winning moulded polystyrene dial. The gramophone unit is the popular three-speed automatic Garrard Changer 110. Shortwave coverage is from 16 to 49 metres, and bandspreading for easy tuning and station recognition, is incorporated. An indicator light which shows instantly when the lowboy is switched on, is mounted on the front of the cabinet.

The cabinet is craftsman-made. It is of selected and matched walnut veneers, and features generous space for storage of records and a single full-length, easy-close lid that will not jar L/P discs. This lid gives instant and easy access to both radio and record changer.

The dimensions of the Ultimate "Rex" Lowboy are: Height, 33½ in.; width, 37 in.; front to back, 18 in. Manufactured by Radio (1936) Ltd., of Quay Street, Auckland, the "Rex" will retail for £129 10s.

* * *

A UNIQUE TABLE-GRAM
THE NEW PYE 95 T.G.

The latest addition to the famous Pye range, the 95 T.G., is a most attractive 5-valve, 6-waveband bandspread table radiogram for A.C. power operation. Set in a highly polished walnut cabinet, the 95 T.G. is unique in that the back is veneered so that the radiogram can be used in a mid-room position where reproduction from the **twin speakers** is at its best. These speakers are two of the 6 in. permanent magnet moving coil type and are used in a correctly designed acoustic arrangement to give stereophonic sound. Another pleasing feature of the 95 T.G. is the dial scale. This is illuminated and extremely clear to read with its vivid colours against a black background. The various wavebands are clearly defined, all important stations are marked and waveband indication is incorporated. The 95 T.G. is provided with a Garrard RC110 3-speed Automatic Record Changer which plays standard, 33⅓ r.p.m. LP Microgrove records or 45 r.p.m. Microgrove records. Distributed throughout New Zealand by Pye (New Zealand) Ltd., Box 2839, Auckland, the 95 T.G. retails at £85 10s. 0d.

A BLESSING TO HOUSEWIVES
The Scott Dispos-o-matic Waste Disposal Unit

Here is a waste disposal unit that is second to none in quality—but—priced below all comparable disposers. Quickly and inexpensively installed the Scott Dispos-o-matic costs only pennies a month to operate, and what's more it is entirely trouble-free. The Scott Hammermill and Grinding Action pulverises **all** waste food, and garbage with ease. Even

(Continued on Page 44.)

TRADE WINDS

NOTABLE SWEDISH VISITOR:

MR. GOSTA BACKSTROM

In the course of a world tour, Mr. Gosta Backstrom, representing A. B. Gosta Backstrom, of Stockholm, visited New Zealand in March.

Travelling throughout the world to ascertain the requirements of different countries for his firm's products, Mr. Backstrom, in company with Mr. P. H. Rothschild, of Fred Rothschild & Son, Lower Hutt, New Zealand agents for his firm, visited manufacturers and wholesalers in Wellington, New Plymouth, Hamilton, and Auckland.

Founded in 1936, the firm of AB Gosta Backstrom originally commenced business as representative for several English manufacturers, notably "Colvern," Eirie, Ediswan-Clix. Since then, it has developed into a large wholesale and research organization handling car-radio antenna, microphones by "Pearl," loudspeakers and P.A. horn speakers, microphone and other types of connectors. In addition, it is also engaged in several research programmes on TV aerials and UHF antenna, as well as high-quality amplifiers of the most exacting standards designed in its own laboratories.

Though his visit was regrettably short, Mr. Backstrom was charmed with the scenic attractions of the country, and we hope that this will encourage him to make another visit at a later date. Meantime, all contacts made will be followed up by Messrs. Fred Rothschild & Son of Lower Hutt.

* * *

A. R. HARRIS COMPANY—SUPPLEMENTARY VALVE DATA FOR USE WITH TAYLOR MODEL 45B VALVE TESTER

Messrs. A. R. Harris Company Ltd., of P.O. Box 1007, Christchurch, announce that they will supply, free of charge, on application to the above address, a copy of Supplementary Valve Data dated September 1, 1954, for use with the Valve Data supplied with the TAYLOR Model 45B Valve Tester.

* * *

BRITISH GENERAL ELECTRIC CO. LTD.

Mr. S. C. Brown, Managing Director of British General Electric Co. Ltd., the New Zealand subsidiary of the General Electric Co. Ltd., of England, has been appointed Chairman of the Company, with Mr. J. L. Griffin, of Wellington, as Vice-chairman. Mr. D. G. W. Acworth, London; Mr. H. R. Biss, Wellington; Mr. J. H. Cormly, Christchurch; and Mr. J. Rowden, Auckland, join the Board of Directors.

* * *

NEW ZEALAND RADIO AND ELECTRICAL TRADERS' FEDERATION

The annual conference of the New Zealand Radio and Electrical Traders' Federation will be held at Nelson from 21st to 24th May, delegates assembling on Saturday, 21st May, enjoying social activities on Sunday, 22nd, and conducting conference business on Monday, 23rd, before dispersing again on the following day.

It is hoped to publish a detailed report of the conference in our June issue.

* * *

DOMINION RADIO AND ELECTRICAL CORPORATION LTD.

The editor took the opportunity during his recent visit to Auckland to call at the new premises of Dominion Radio and Electrical Corporation, situated at Huia Road, Otahuhu.

While many know that DRECO, as they are known to the trade, have had under way a new building project, little publicity has so far been given to this further milestone in the progress of the Radio and Electrical manufacturing industry in New Zealand.

The building is now receiving its final touches, and a complete removal from Newmarket has yet to be

C. Pearson and two contractors at entrance to new factory.

effected. Within the next month it is expected that all phases of manufacture and the ancillary departments will be in full operation on the six-acre factory site at Otahuhu. Obviously, when completed, it will be smart in exterior appearance, and the interior lay-out has been designed with a view to peak efficiency in the specialized manufacture of radio and electrical appliances.

Charlie Pearson, who has kept a watchful eye on the building as it progressed, was O.C. "Operation Removal." The brunt of the change-over has been borne by the key personnel; all had a smile, but did not conceal that they will be most happy when DRECO'S entire operations are at Huia Road.

There have been difficulties in the change-over, as would be expected, although detailed planning did reduce this to a minimum. One complaint seemed to be that their distributors, Russell Import Co. Ltd., had given them no respite in the matter of deliveries and seemed to be expecting the increased output to take place as soon as the foundations were laid.

Mr. Trevor Gobby, Manager of DRECO, will be most happy for interested members of the trade to inspect the factory any time they happen to be in Otahuhu during the normal working hours. The invitation is well worth accepting, because this is the first factory in New Zealand which has been built from the ground up specifically for a radio and electrical manufacturer. It can truthfully be said that raw materials enter one end of the building, go through various stages of processing, to come out as complete merchandise, tested and packed ready for dispatch to the numerous retailers who look to this factory for supply.

NEECO MANAGERS' CONFERENCE

A recent gathering of Neeco Executives from branches in both Islands was held at Head Office, Wellington. Visiting managers included: Mr. R. S. Donovan, Auckland office; Mr. J. Cunningham, Christchurch office; Mr. J. Simpson, Dunedin. Also present was the Wellington manager, Mr. D. H. Shortt, the meeting being under the chairmanship of Mr. C. E. Fuller, Director and General Manager.

Others attending included Messrs. J. G. Ritchie, secretary; P. D. England, sales manager; N. H. Matthews, advertising manager; L. E. Exley, factory purchasing officer; and Head Office Engineering Executive Staff—Messrs. F. K. Garry, S. C. McDiarmid, J. G. Naylor, and P. C. Weston.

New Products

(Continued from page 42.)

heavy meat-bones. Look at these top quality features:

(1) **It's Quiet**—No metal to metal contact. The entire unit floats in rubber to absorb vibration and muffle noise; it gives you purring quiet operation.

(2) **IT'S POWERFUL**—Faster action, positive action, with rugged ½ h.p. motor. This extra power helps prevent jamming, hurls ground-up waste down drain in seconds.

(3) **IT CLEANS ITSELF**—Every time it's used, constant water pressure, built up by the whirling hammers and impeller, whips away ground waste, then flushes unit spotlessly clean. What is more, this continuous water pressure actually keeps traps and drain pipes "Gun Barrel" clean, too.

(4) **IT'S EASY TO USE**—Just remove the plug assembly, the unobstructed drain opening and big-capacity hopper permit fast, easy disposal of waste direct from plates or pans. Simple as 1, 2, 3. . . .

NEW ZEALAND ELECTRONICS INSTITUTE (INCORPORATED)

Messrs. P. O'Sullivan, of Christchurch, and E. C. McLauchlan, of Green Island, were admitted to membership of the Institute in March last, while Messrs. A. D. Hughes, of Hastings, and M. M. Gillick, of Dunedin, were transferred from the grade of Associate to that of Associate Member.

"ROOMWARMA" AT THE SHOW

Cynosure of attraction on stands 82 and 83 at the recent Auckland Easter Show was the new "Roomwarma" central heater, latest product of L. T. Hayman Limited, Victoria Street West, Auckland.

This very attractive electric convection heater embodies all the latest features for efficient central heating, and for efficiency, power economy, safety, and appearance, the "Roomwarma" gains top marks. Details were published in the "New Products" section of our April issue.

Other electrical appliances on display on these stands were two models of clothes airers, a drying cabinet, linen cupboard heater, footwarmer, infra-red health lamps, three models of washer boilers, an electric wringer to fit wooden or concrete tubs, a built-in rustless metal washing tub, "Solight" ranges, rangettes, and ovens, commercial toaster, pie oven, griller plates, food-warming oven, egg frier, and fish vat. Poultry farmers were specially interested in the "Dullray" chicken brooders, "Ascot" automatic poultry feeders, and electric egg testers.

SEE YOURSELF AS OTHERS SEE YOU

Once again H.M.V. (N.Z.) Ltd. were well to the fore at the Auckland Easter Show with an attractively arranged display of radios and radiograms, together with a comprehensive range of household appliances, refrigerators, washing machines, etc. Selections from the large range of records manufactured and imported by this firm were displayed on the walls. Highlight of the exhibit was the demonstration of the latest E.M.I. closed circuit TV transmitter, camera and receiver, which delighted the eager audiences by letting them see themselves on the TV screens of various receivers on the stand and in other parts of the building.

(5) **IT COSTS LESS TO INSTAL**—Compact and adaptable, "Scott" Dispos-o-matic is quickly and inexpensively installed in almost any sink. No need to change most existing drain lines.

(6) **IT COSTS LESS TO OPERATE**—Uses a minimum of electricity to operate.

(7) **IT'S TESTED AND APPROVED** — The "Scott" Dispos-o-matic has been fully tested and proved in home use.

The Dispos-o-matic is another product of J. & A. P. Scott Ltd., Dunedin, manufacturers of the famous Whirlpool Washing Machine which incidentally has proved amazingly trouble-free since its introduction to the market some time ago.

Both these "musts" in houshold appliances are distributed throughout the North Island by G. A. Wooller & Co. Ltd., Head Office, Box 2167, Auckland, and at 43 Lower Taranaki Street, Wellington. The Dispos-o-omatic retails at £39 19s. 6d. and the Whirlpool at £63 17s. 6d.

SALES PROMOTION AIDS

This month we have news from two progressive firms of new ideas for the improvement of record departments.

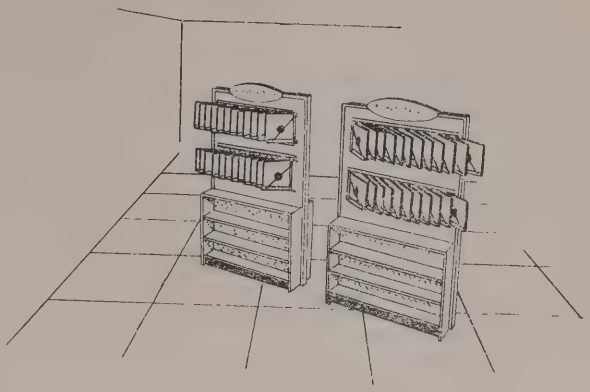
H.M.V. Self-service Scheme

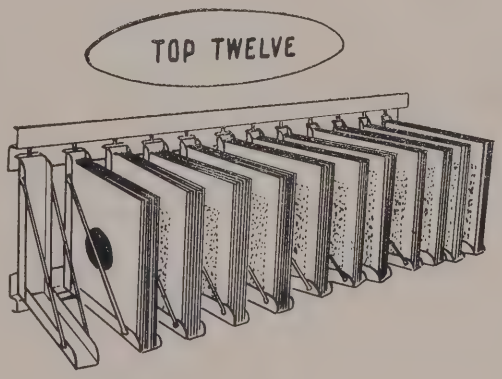
H.M.V. (N.Z.) Ltd., after making a careful study of existing self-service schemes, including some in America and Europe, adapted the best features of these to the specialized requirements of their new record self-service scheme illustrated on this page.

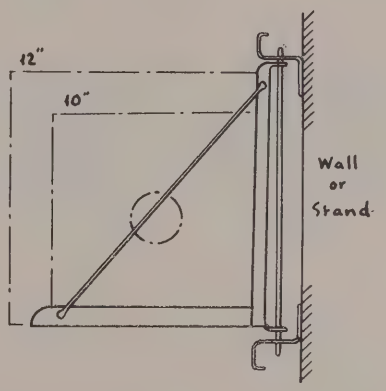
Records are contained in a series of specially arranged racks, which are classified under such headings as: "This Month's Releases," "Top Twelves," "Film Hits," "Dance Music," etc. The record racking is arranged in 3 ft. runs, holding 144 records, with an oval title board fitted above each rack, pin-pointing the particular category. Each 3 ft. run of racking holds 12 trays containing 12 records. The trays are swivel-mounted so that the titles may be read easily without removing records from the rack.

As can be seen from the sketches, the runs are mounted either on island stands or directly on the walls. Customers do not have to refile unwanted records themselves, but simply place them on the shelves provided, to be filed later by assistants.

Complete record display rack units are now available for £7 (net).







G. A. Wooller & Co. Ltd.—Festival Library Parcels.

Festival Library Parcels are now available to dealers for offering to purchasers of new radiograms. These parcels are obtainable in three types—Popular Hits, Light Music, and Classics, covering all tastes in music and retailing at approximately £10 each. The number of records varies according to the type of parcel.

These Festival Library Parcels should prove an asset to retailers. Amongst their outstanding advantages can be listed increased sales value, for it is only natural that every radiogram purchaser should be receptive to suggestions concerning records at the time of purchase. Here, then, is an excellent opportunity to increase the value of the sale by introducing the Festival Library Parcel.

The time-saving factor of these parcels is another advantage, freeing retailers to make more sales at busy times, for normally much time is absorbed while customers choose records.

In addition, these Library Parcels give an added service to the purchaser, for quite frequently the latter is uncertain of the records he wants. He knows the kind of music he likes, Pops, Evergreens, or Classics, but is vague about the titles. Thus, the Library Parcel gives him an immediate start without wasting either his time or that of the retailer.

All in all, we feel sure that purchasers are going to enjoy buying their records during the next few weeks.

"R & E" TECHNICAL PHOTOGRAPHS

Copies of original designs produced in our laboratory and featured in these pages are available. Prices are: Size 6 in. x 4 in. 3s. 6d.; 8 x 6, 4s. 6d.; 10 x 8, 5s. 6d. Please remit cash with order to Radio and Electronics (N.Z.) Ltd., P.O. Box 8022, Wellington.

LATEST OVERSEAS DEVELOPMENTS

NEW MAGNETIC TAPE

Minnesota Mining and Manufacturing Co., St. Paul, Minn., U.S.A. has introduced a new magnetic tape that automatically increases the recording time of any tape recorder by 50 per cent.

The new "Scotch" brand "Extra-play" magnetic tape 190 marks the first time since the advent of dual track recording that a major increase in recording and playback time has been possible without decreasing the tape speed or employing a larger reel.

The principal feature of the tape is a new high-potency oxide coating only half as thick as standard coating, but with equivalent magnetic properties. Coupled with the high-potency oxide is a new, thinner backing of tough cellulose acetate.

NEW E.M.I. CAMERA SYSTEM

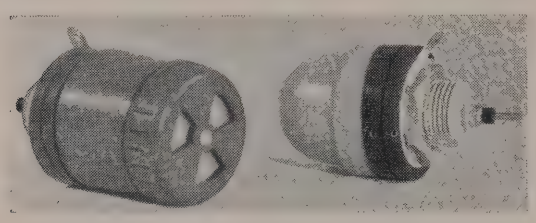
E.M.I. engineers have devised a new TV camera system for colour television, using only a single-tube camera, which can be used on any of the present television system standards and provide a compatible colour signal. Normally, a colour TV camera requires three camera tubes to provide three colour pictures simultaneously, although there is one two-tube camera, but a single-tube camera scans sequentially one colour at a time.

The new E.M.I. camera scans sequentially at 150 frames per second, but this is unsuitable for the B.B.C. standard and for the American or Continential standards, which have 50 or 60 frames per second. The important new feature in the E.M.I. system is a converter which converts the 150-frame sequential colour signal to a 50-frame (or 60-frame) simultaneous signal. It is then suitable for any colour TV system.

The method is similar to the "Chromacoder" used by General Electric and Columbia Broadcasting in America, and much of its success depends upon the application of the E.M.I. pick-up tube which is used in the B.B.C. studios and has been adopted by the C.B.S. for their colour television service. The advantage over normal colour cameras are compactness, lightness and a much simplified optical system, while the complexities associated with the watching of three-pick-up tubes are avoided.

A modification to the existing E.M.I. film scanner, which is used by broadcasting authorities in Britain and overseas, enables that equipment to produce colour TV pictures of very high quality, also applicable to all existing standards. This involves the splitting of the colour paths.

E.M.I. emphasize that both these systems, which have been demonstrated to the B.B.C., the G.P.O., the T.A.C., and to members of the European Broadcasting Union, are still experimental, and it may be some time before they can be sufficiently standardized to offer them for a regular programme service.



PLESSEY NEW SEALED LAMPHOLDER BUILT-IN DIMMER ATTACHMENT

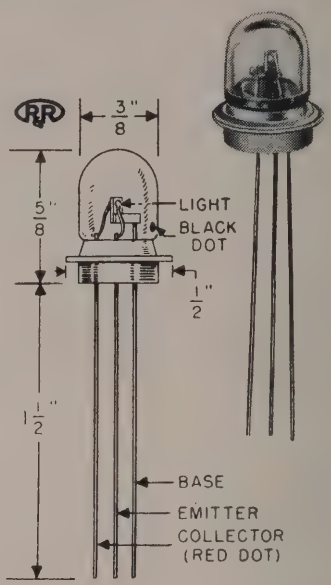
A new lampholder, designed primarily to hold lamps with standard miniature Edison screw caps, for use on radio and electronic equipment, is being manufactured by Plessey. Of robust construction, the lampholder conforms to B.S. 98: 1947, and is suitable for use in a panel of any thickness up to a maximum of $\frac{1}{4}$ in.

The body of the holder, which is sealed to exclude moisture, is machined from high quality brass and insulated from the panel. A centre contact of spring-tempered barryllium copper, insulated from the body by a perbunan seal, completes the circuit to the bulb. All metal parts, with the exception of the contact spring, are silver plated and connecting tags are tinned to facilitate soldering.

Two interchangeable caps are available. The first is a ureaformaldehyde moulding supplied in a wide variety of colours to suit individual requirements. The second is a dimmer cap of entirely new design. This consists of a light alloy diecasting fitting with a plastic filter which is coupled to a shutter. Rotation of the filter, also available in many colours, enables the quantity of light transmitted to be varied from maximum to zero. A smooth action is obtained by the use of a silicone treated rubber compression ring between the body and the shutter.

This lampholder, which is of very robust construction, complies with the relevant Joint Services Radio Component Specifications and Radio Component Specification (Prov.) 201 for Lampholders. Its rating is 3.6 watts.

NEW MINIATURE PHOTO TRANSISTOR AVAILABLE FROM RADIO RECEPTOR COMPANY



Radio Receptor Co. announces a new miniature PNP photo transistor, Type RR66, which was developed for use in automobile headlight dimmers, but which will be equally useful in a large variety of industrial control applications. The light sensitive element, hermetically sealed within a glass bulb, is connected to three leads which emerge from a glass header. The bulb diameter is $\frac{3}{8}$ in. and height overall $\frac{5}{8}$ in. The spectral response covers the visible range and extends far into the infra-red so that it is especially useful in black light applications. The RR66 photo transistor features an available base connection which permits thermal stabilization in modulated light applications.

Complete details are available from Rocke International Corporation, 13 East 40th Street, New York 16, N.Y., U.S.A., which acts as the Export Department of Radio Receptor Co. Inc., manufacturer of Selenium Rectifiers, Germanium Diodes and Transistors.

MISSING AND STOLEN RADIOS

AUCKLAND:

Five Star A.C./battery portable, serial No. 43313, black plastic Cabinet 18 in. x 12 in. x 9 in., with white mesh over speaker.

H.M.V. battery/electric portable, serial No. 54891, model No. 601.

Ultimate seven valve, 12 volt auto radio, serial No. 165896, both speaker and tuner cabinet of irridescent brown baked enamel, two tuning knobs, oblong dial.

PAPAKURA:

Bell 5 valve bedside mantel radio, model 5B4, slide rule dial on right, green and red bakelite cabinet.

ROTORUA:

Pacific model 6P1 radio, serial No. 22373.

TE KUITI:

Pye mantel model PZ69, six valve, mahogany cabinet, serial No. 44113.

NEW PLYMOUTH:

Areil Seven auto radio complete with aerial, serial No. one of following, 4326, 4344, 4575, or 4574.

PALMERSTON NORTH:

Mullard Model 604, serial No. 66565, maroon cabinet.

A.W.A. mantel model, six valves, serial No. B. 0011729, dark oak bakelite cabinet.

LOWER HUTT:

Columbus auto radio, model M.7, 5 valves, broadcast, serial No. 73-703, brown crackle finish cabinet.

CHRISTCHURCH:

H.M.V. 5 valve, broadcast mantel radiogram, walnut veneer cabinet 16 in. x 12 in. x 20 in., four white control knobs, orange coloured bars on front of louvres, white flecks of paint on top. One side blistered by heat. Fitted with 14 ft. of flex, adaptor and 6 ft. white flex.

Courtenay broadcast model, cream case 20 in. x 10 in. with one rounded corner into which speaker fitted, three brown control nobs.

DUNEDIN:

His Master's Voice 12 volt auto radio for Wolsely car, serial No. 40668, push button selection of 5 stations, tuning and control, amplifier and speaker.

AUCKLAND:

Ultimate, 5 valve broadcast, D.C. Converted to A.C. mantel model, worn walnut wooden cabinet 18 in. x 8 in. x 8 in., square dial, three control knobs. 6 ft. of flex with three point plug.

Pacemaker, 5 valve portable, serial No. 30380, grey plastic case 12 in. x 9 in. x 6 in., lift up front containing dial.

Philco, 5 valve bandspread model, serial No. 49956, brown plastic case.

Pacemaker, 5 valve broadcast, battery/electric model, serial No. S30984, grey bakelite case 12 in. x 8 in. x 6 in. with small scratches at right hand end. Sand may be present in set which is faulty and due for repair.

H.M.V. Personal Portable, model 484P, 4 valve battery set, serial No. either 21478 or 2149, buff plastic case with 2 in. nut brown beading. Radio operates when lid raised.

MANGAKINO:

Philips, 5 valve mantel model, brown plastic case with glass tuning dial on top, five plastic grille bars across front, one being broken.

WELLINGTON:

Collier & Beale, ship radio type 641DW for 6 or 12 volt D.C. operation, grey steel cabinet 14 in. x 10 in. x 8 in., mounted on shock absorbers for screwing down to bench. Speaker and transmitter controls in front.

H.M.V., push button car radio, serial No. 32584, model No. 524 A.M.P., licence No. 99065, no dial face.

Mullard, 5 valve model 511, serial No. 65993, licence No. 34430, brown plastic case with white grille.

Mullard, 4 valve model 454, serial No. 8493, licence No. 77056 maroon plastic cabinet with cream facings.

Mullard, 5 valve model 611, serial No. 65993, licence No. 108324, fawn imitation plastic wood cabinet.

Cromwell, 5 valve broadcast mantel model, serial No. 19725, royalty No. 70047, ivory plastic case.

AROUND AND ABOUT

HOW FAST DID THE M.C.C. BOWLERS TOSS THAT BALL?

If that question has been bothering you, the Dominion Physical Laboratory can provide the answer.

Using a special radio device, scientists during a special radio-wave speed test held at Wellington College, checked ""Typhoon" Tyson at a shade more than 87 m.p.h. and J. B. Statham at slightly more than 85 m.p.h. In fairness to the M.C.C., we should state that bowling conditions were not ideal, and it was obvious to spectators that both men were not bowling quite flat out.

These scientific checks were part of the department's investigations to measure the relatively high speeds of small objects travelling over a short distance—information which must be collected in a fraction of a second.

In the past, high-speed photography has been used to gather data, but, because of the limitations of this method, the department's researchers considered the use of a radio beam, along which the object to be checked would travel, a more accurate measuring medium.

Briefly, the method used was to direct a radio beam up a cricket pitch. The ball, travelling down the pitch, reflected radio energy back to the aerial, and electrical equipment converted the velocity informa- into a radio frequency. The pitch of the note produced by the ball moving down the radio beam was signalled back and recorded on a tape recorder. This was heard as a whistle on the tape recorder, and the frequency of the pitch of the whistle was later measured accurately in one of the department's laboratories. From this information, the speed of the ball was determined.

RECORD ROUND-UP

A report published in the London "Financial Times" of 18th September reveals that records are now selling in Britain at an unprecedented rate, variously estimated at between 35,000,000 and 40,000,000 annually.

Shellac holds the field for popular items, and, in spite of the growing popularity of L/Ps and 45s, business in the standard 78 r.p.m. record is at present not only being maintained but has increased.

There is no comfort here for the classically minded, and the imminent death of 78s of "serious" music is of particular concern to the music-teaching profession, whose interests, we fear, will be overlooked.

The report quotes some interesting figures of costs in making records. A complete opera with a star cast may cost between £5,000 and £6,000, an orchestral recording with two rehearsals £1,200—before the conductor receives his fee.

PUBLICATIONS RECEIVED

From Amalgamated Wireless (Australasia) Ltd.:
"Marconi Instrumentation," Vol. 4, No. 8, December, 1954.
"Aerial," January, 1955.
From Beacon Radio Ltd.:
"Beacon Catalogue," 1955.
From A. E. Cawkell, Southall, England:
"Sonic and Ultrasonic Methods for Testing Engineering Materials" (with particular reference to Concrete).
From H. W. Clarke (N.Z.) Ltd.:
"Westinghouse Engineer," Vol. 15, No. 1, January, 1955.
From National Electrical and Engineering Co. Ltd.:
"G.E. Ham News," Vol 9, No. 6, November–December, 1954.
"G.E. Ham News," Vol. 10, No. 1, January–February, 1955.
From Philips Electrical Industries of N.Z. Ltd.:
"Mullard Technical Communications," Overseas Edition, Vol. 1, No. 9.
"Philips Serving Science and Industry," Vol 1, No. 3, May, 1954.
"Philips Technical Review," Vol. 15, No. 10, April, 1954.
"Electronic Application Bulletin," Vol. 15, No. 3, March, 1954
From Richardson McCabe & Co., Ltd.:
"Technique," Vol. 9, No. 1, January, 1955.
From Standard Telephones and Cables Pty., Ltd.:
"Electrical Communication," Vol. 31, No. 3, September, 1954.
From the Television Society, London:
"Journal of the Television Society," Vol. 7, No. 8, October - December, 1954.
General Publications Received:
"Aeromodeller," Vol. XX, No. 228 and 229, January and February, 1955.
"A.P.A.E. Journal," Vol. 5, No. 9, December, 1954.
"Break In," Vol. XXVIII, No. 3, March, 1955.
"das elektron," December, 1954, January, 1955.
"Electrical Industries Export," Vol. 55, No. 1 and 2, January and February, 1955.
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"Electronic Engineering," Vol. 27, No. 323 and 324, January and Feburary, 1955.
"The Gramophone," Vol. XXXII, No. 379 and 380, December, 1954 and January, 1955.
"N.Z. Electrical Journal," Vol. 28, No. 2 and 3, February and March, 1955.
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"Radio Electronica," Vol. 3, No. 1, January, 1955.
"Radio Electronics," Vol. XXVI, No. 2, February, 1955.
"Radio and Television News," Vol. 52, No. 6, December, 1954, and Vol. 53, No. 1, January, 1955.
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"Sales Promotion," Vol. 1, No. 4, April, 1955.
"Service," Vol. 23, No. 12, December, 1954, Vol. 24, No. 1, January, 1955.
"Wireless and Electrical Trader," Vol. 96, No. 1260–1262, Vol. 97, No. 1263–1268.
"Wireless Engineer," Vol. 32, No. 1, January, 1955.
"Wireless World," Vol. 61, No. 1 and 2, January, and February, 1955.

Record Talk

(Continued from Page 35.)

Coral and Decca catalogues. One of the brightest adornments of the Coral series is Teresa Brewer, whose long line of successes shows no sign of ending and whose latest is "Let me go Lover," just made available on DNZ 36 and backed by a song called "The Moon is on Fire." Charlie Kunz, now recovered after his long period of inactivity is back again as though nothing had ever interrupted his series of medleys. The latest is numbered 114, gives the expected mixture, and is released on Decca F 10419. There is always interest in HMV's occasional releases of imported English discs. Those with a flair for authenticity might care to sample the Sea Shanties as sung by Stanley Slade on H.M.V. B 10605. Mr. Slade is, or was, a genuine old shantyman who served on sailing ships sixty years ago, and in listening to his intoning of the old favourites you may feel that you are hearing at least an echo of the real thing.

The latest H.M.V. LP list contained, appropriately, an Easter offering in the form of Bach's "St. John Passion," the first version to me made available here, and sung in English by the Robert Shaw Chorale and soloists with the RCA Victor Symphony Orchestra under Shaw (ALP 1188-90). There are extensive song recitals by Jussi Bjorling (ALP 1187), Kirsten Flagstad, who includes Schumann's "Woman's Love and Life" cycle (ALP 1191) and Victoria de los Angeles, who performs Turina's "Canto A Sevilla" with the London Symphony Orchestra under Fistoulari on ALP 1185. This entrancing composition has alternate orchestral and vocal section, and would be my personal "record of the month." Then there is a brilliant performance of Schumann's "Spring" Symphony by the Boston Symphony Orchestra under Munch (ALP 1203) and Dame Myra Hess records Schumann's Etudes Symphoniques on BLP 1061.

From Columbia is a definite Tchaikovsky No. 5 by the Philharmonia under Von Karajan (33CX 1133). Playing and recording are alike splendid, Karajan maintains magnificently steady throughout and does not make the usual maddening cut in the last movement. Indeed this issue seems to wipe the floor with all others I have heard. No worries here about the horn soloist in the andante! Another Tchaikovsky disc by the Philharmonia, under Paul Kletzki this time, introduces the vast and colourful "Manfred," by courtesy a symphony but really an extended symphonic poem heartily recommended to the many devotees of this composer (33CX 1189). But the Columbia set likely to give the keenest pleasure to the most people is the Johann Strauss operetta "Vienna Blood," issued on 33CX 1186-7; 3 sides only, with a consequent lowering of the price because of the blank fourth side. This is not just another operetta based on the music of Johann Strauss, for although it was not produced until after his death, he himself had a hand in it. Some very familiar melodies are included, of course, and once again we have Columbia's favourite operetta cast: Schwarzkopf, Gedda, Kunz etc. with the Philharmonia under Ackermann. Instrumental discs include one of the four Chopin Scherzi played by the reliable Louis Kentner on 33SX 1033, while Denis Matthews appears as soloist in the best known Mozart concerto in A major, with the Philharmonia reputation grows with every record, is heard in Schumann's Carnaval Suite and a collection of Chopin on Parlophone PMA 1022.

R.F. Heating in Industry

(Continued from Page 37.)

heating for cooking on a large scale is being actively investigated. The application of the higher frequencies may make it economic for such purposes as defrosting processes in the food world, the drying of printing inks, and pest destruction.

SEALING AND JOINING

At the same time, while the use of radio frequency is now indispensable for sealing and joining a variety of materials, there are new materials coming into commercial use (titanium, for example) where radio heating will be essential for processing. The price of installed radio-frequency heaters varies from about £250 for a 300-watt set up to perhaps £10,000 for a 100 kw. set. The main part of the equipment can be manufactured in standard sizes, but it has then to be adapted in working to the particular requirements of the industry requiring it. The U.K. industry —with about ten firms manufacturing radio frequency heating equipment, in which two, Redifon and Redyne, specialize—is as technically advanced as its United States counterpart; but here there is generally less willingness on the part of industry to try the new techniques it makes possible. Already, however, radio frequency heating equipment is recognized as a vital capital investment in hundreds of factories.

New Zealand representatives of Redifon Ltd. are Messrs. Collier & Beale Ltd., P.O. Box 6053, Wellington, who will be pleased to answer all inquiries concerning Redifon products.

Time to Sell Timers

(Continued from Page 40.)

exposure may do harm, but it is not noticed at the time. A time-switch will control the period safely.

Some ladies are fearful of entering a dark house alone and would appreciate a hall light switched on in time for their return.

RURAL USES

A dealer selling in rural areas will be able to show the occupier of electrified farms many uses for the time-switch. In the open-run and deep-litter poultry-houses a switch may be fitted to put on full lighting or artificial twilight at the appropriate times. For the battery house there is the simple on-and-off control.

Sterilizer heating may be switched on early in the morning ready for the workers. Switching off yard lights, controlling infra-red warming, etc., are among the other rural uses of the time-switch.

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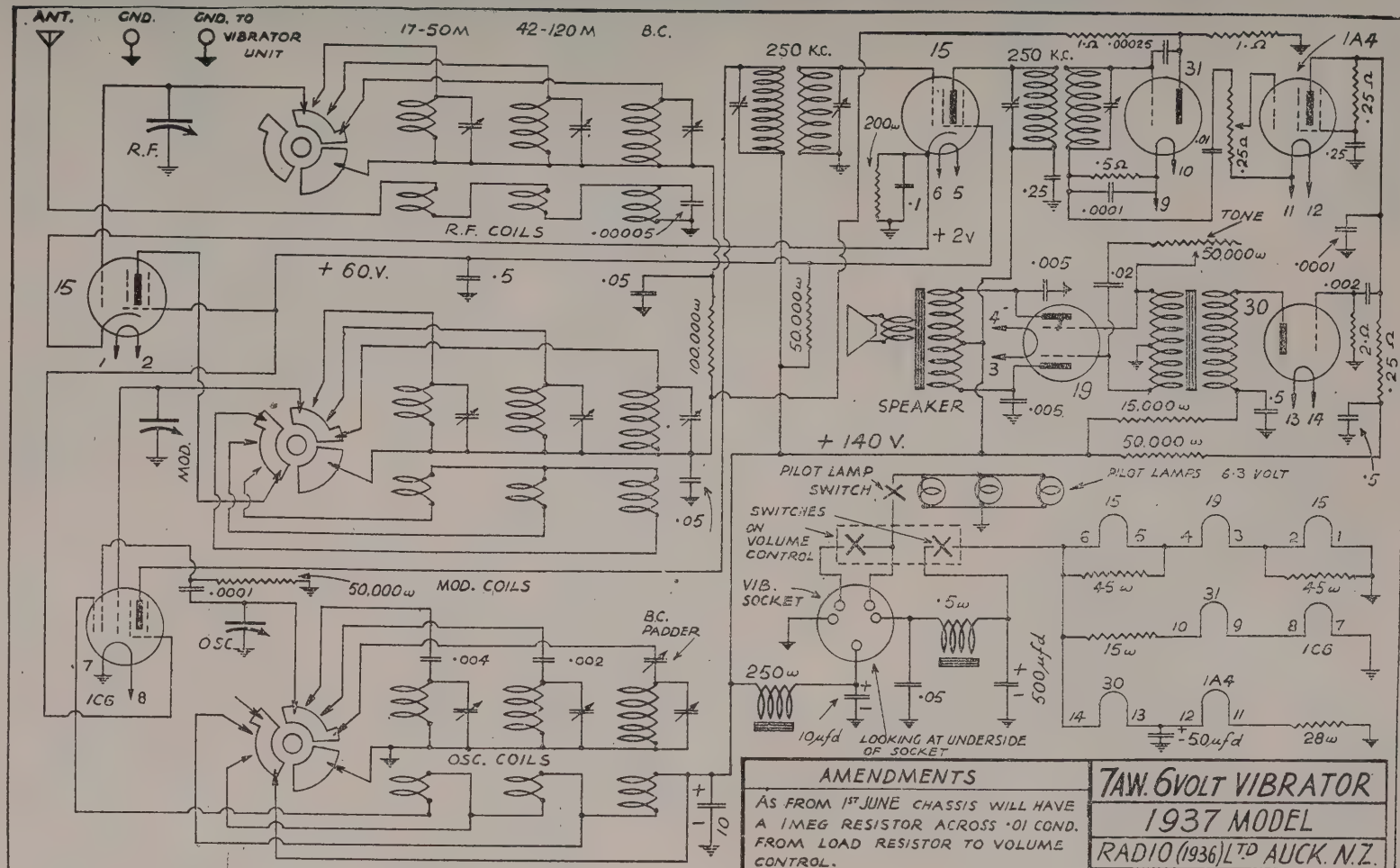

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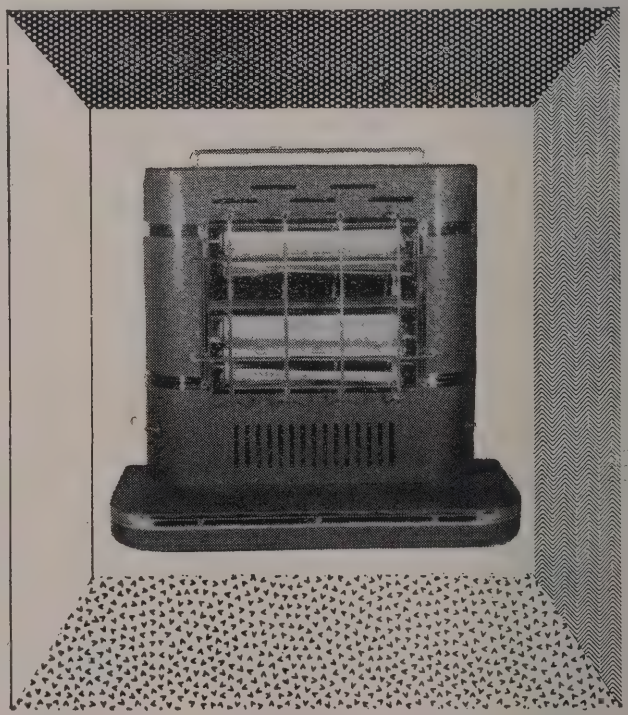

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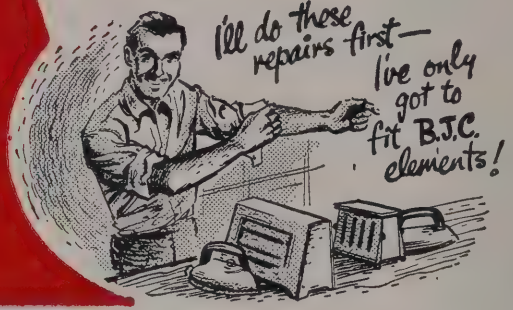

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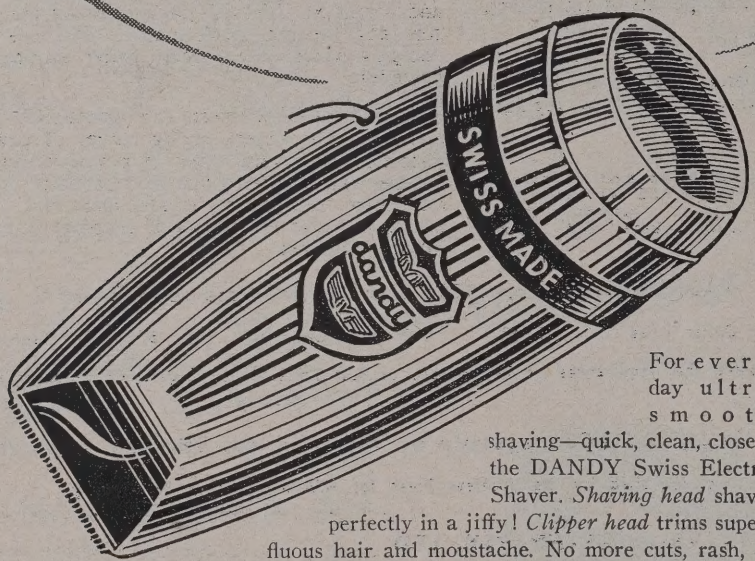

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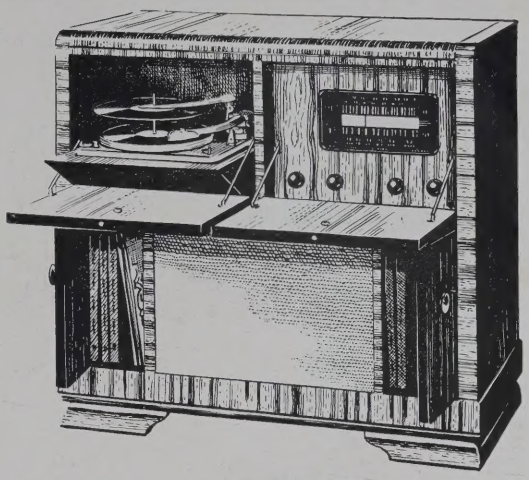

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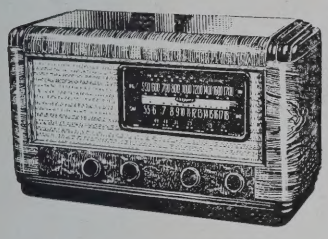

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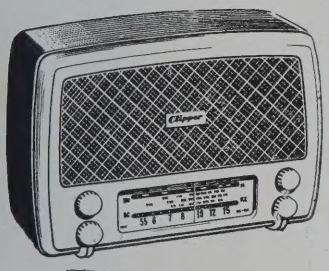

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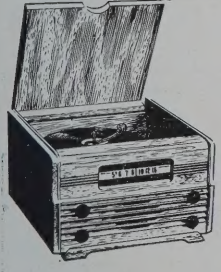
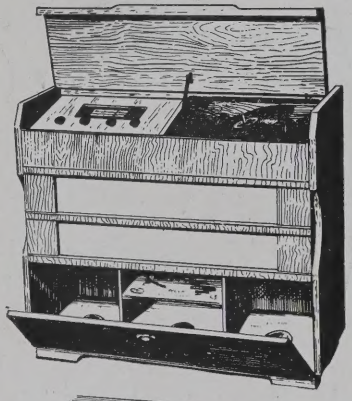


MODEL "5G4" 5-valve, broadcast 3-speed table radiogram. Light or dark oak cabinet £44 10s.

MODEL "725 RG" 7-valve, world-wave console radiogram with 3-speed changer in luxury walnut cabinet £116.



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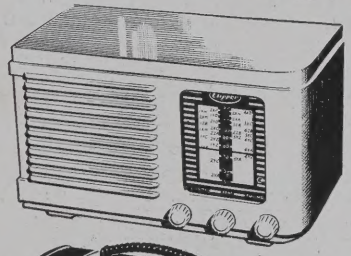

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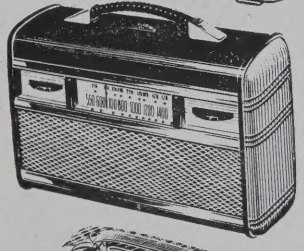

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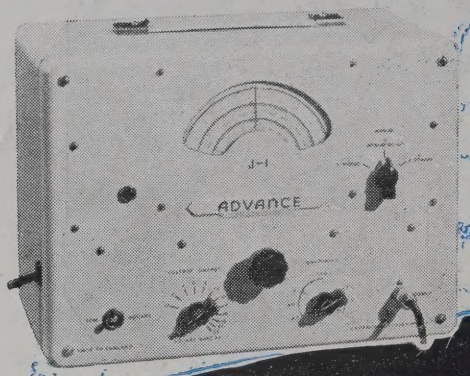

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We wish to announce our appointment as sole New Zealand Agents for "ADVANCE" Signal Generators, now available at a new attractive price range. In addition, "ADVANCE" manufactures constant voltage transformers in a range of 10 watts to 6 K W; 11 types available in either standard or tropical finish. Also, "VOLSTAT" adjustable voltage stabilizers, "ADVOLT" automatic voltage boosters, and KI magnetizers.

Illustrated folders, giving full technical details, are available on request.

AUDIO FREQUENCY SIGNAL GENERATOR FOR THE AUDIO ENGINEER

Frequency Range 15 c/s to 50,000 c/s in three bands.

Frequency Accuracy: ± 1% ± 1 c/s.

SERVICE OSCILLATOR

Frequency Range: 100 Kc/s to 100 Mc/s in six bands.

Calibration Accuracy: ±1%.

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